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GAS

30th Year of Publication

OCTOBER 1945 · VOLUME XXX · NUMBER 10

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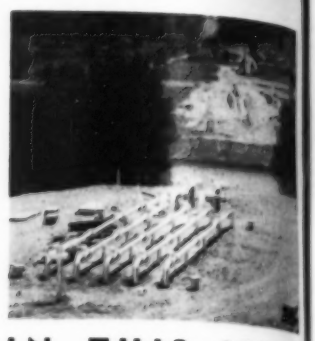

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Columbia Gas will begin receiving its first deliveries of gas from Gulf Interstate at this metering station near Means, Ky. on Nov. 1. For full details, see articles beginning on page 51 and 129.

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Thermally Thinking

SPOT NEWS AND COMMENT ON GAS INDUSTRY AFFAIRS

Highlighting the News

Northern signs contract for Canadian gas

Shut out in its bid for a Pacific Northwest market, Canada may yet be providing gas for U. S. consumers. Northern Natural Gas and Trans-Canada Pipe Lines announced simultaneously that a 25-year pact has been signed to permit Northern to take gas from the yet-to-be-built Alberta-to-eastern-Canada main for transport to Minneapolis. From a 24-in. Trans-Canada spur, running from Winnipeg to Emerson on the Manitoba-Minnesota border, Northern would receive an initial 100 MMcf per day, with volumes increasing in 50-MMcf per day increments each year for four years. Approvals of both governments are yet to be obtained.

U. S.-Canada gas treaty would help clear the way

N. E. Tanner, president of Trans-Canada, wants a treaty that would permit a free exchange of fuel between the two nations, he told delegates to last month's INGAA convention in New Orleans. "Surely a treaty could be worked out whereby both countries would feel entirely safe in relying on each other for a source of supply."

Invalidation of Oklahoma price law by high court asked

Michigan-Wisconsin, Natural Gas Pipeline, and Panhandle Eastern have petitioned the Supreme Court to rule the Oklahoma price law invalid as it pertains to deliveries at the outlet of gasoline plants for interstate shipment. The companies contend the Phillips decision places such sales under FPC jurisdiction and thus beyond the reach of the Oklahoma Corporation Commission.

Plant, equipment outlays take minor drop in 1954

Expenditures by all types of utilities are slipping about 6% from 1953's all-time record, but 1954 will still be the second best year of all time, the Department of Commerce and the Securities & Exchange Commission announce. The margin of drop is identical with that of the total of all industries. In 1953 utilities spent $4,548,000,000; in 1954 they are headed for a $4,274,000,000 mark.

Texas gathering tax now 9%

As of Sept. 1, the rate increased from 5.72%, and under the FPC Order 174-A regulating producer prices, it cannot be passed on to the pipelines without special commission action.

Arkansas PSC disclaims authority to ban utility appliance sales

A petition by contractors to prevent Arkansas Louisiana Gas Co. from making direct sales of appliances was dismissed by the Arkansas commission, which held it is without authority in the matter. The contractors had claimed the company subsidized its non-public utility operations to the extent of $70,000 annually and was using its "assured profits" as a "protected monopoly in destructive competition with private enterprise."

AGA has new course in accident prevention

A two-day seminar was given a pilot run at Fort Dodge, Iowa, last month, and as the result the association has announced that the course will be available for future staging. The course is slanted toward foremen, supervisors, and superintendents, and details methods of setting up safety programs, making safety talks, investigating and analyzing accidents, planning and conducting a safe operations meeting, and securing favorable worker responses. Thirteen pamphlets and booklets dealing with every aspect of accident prevention are distributed in the course.

IOCC joins battle on FPC jurisdiction question

The Interstate Oil Compact Commission will urge Congress to amend the Natural Gas Act to make it clear FPC has no authority to fix the price of gas sold for interstate commerce. A resolution to this effect was approved at its latest meeting. INGAA is up in arms, too, as noted elsewhere in this issue.

Will FPC force producers to sell gas interstate?

The commission has been petitioned to force producers in the La Gloria field in Texas to sell to an interstate pipeline. This case may be the first real test of the scope of FPC's powers under the new policies stemming from the Supreme Court's Phillips decision.

Matters for Management

Pacific Northwest still holds the aces

SEATTLE—Out of all the welter of rumor quotes and misquotes, truths and half-truths that weighted the atmosphere of the great Northwest last month, only one fact stood out with any real degree of clarity—Pacific Northwest Pipeline Corp. holds the aces, and until someone can show a trump card the kitbitzers will have to string along with them.

Rumors were a nickel a gross at the Pacific Coast Gas Association convention in Vancouver, B. C., earlier in the

Thermally Thinking

month, and their echoes were still bouncing off the rugged Pacific ranges for days afterward. But to all and sundry the victorious principals had merely to smile with a certain justifiable air of smugness and wave a certificate in reply.

By the time this is in print, the losers and their intervening friends may have carried out their threat to take the matter to the courts—the deadline is Oct. 4—but representatives of both Pacific Northwest and Seattle Gas Co., its chief supporter, bravely asserted such a move could at worst—or at best, depending upon the point of view—merely delay the inevitable. The failure of Westcoast and its friends to move more rapidly was attributed, by supposition, to a desire to add a brief delay to whatever other delays might be effected; and by rumor, to a smouldering hope of making a "deal."

A trip by Pacific's Vice President Robert Herring into Canada shortly after the announcement of FPC's decision was interpreted by some as a rather desperate play to pick up some gas reserves to augment a "short" supply, and there was talk that President Ray Fish was dickering for a supply—a hundred million a day or so—to be delivered from Canada to the border in the vicinity of Vancouver. The supplier? Westcoast. But the less titillating explanation was that Pacific still hopes to bring Southern Alberta gas into its system with an eye to serving Vancouver along a route similar to that previously laid out. There was said to be some high-level chit-chatting and dickering going on among principals and public officials in Canada, but reliable confirmation was not forthcoming.

Vancouver newspapers, in true fashion, worked hard to obtain some interesting quotes that would prove comforting to their readers. The most persistent rumor held that Westcoast, or someone, was working on a scheme to sail right through Vancouver, bypassing inimical markets, and carrying Peace river gas to northern California. Even Pacific was said to be involved in the plan in some fashion. Representatives of California utilities were quoted as being receptive to Canadian gas, but the matters of price and other economic factors were not generally dwelt upon. The only fact with a real stamp of authority upon it seemed to be that the major California companies will be needing more and more gas in the future, and if their supply of San Juan basin gas is jeopardized, they may look farther afield. Some of the tipsters think this may come from the Rockies area.

As for Vancouver itself, the talk of subsidizing a line from Peace river could not be entirely discounted. Canada looks with more kindly regard upon such proposals than does the U. S. and B. C. is on the verge of a near boom, they say. Natural gas, along with a greater supply of LPG that may be imminent, could help fuel it.

On the whole there appeared to be a genuine neighborly concern upon the part of everyone, including those who will profit by a decision that excludes her from its rewards, over B. C.'s gas problem. Such hospitality as she showed certainly deserved more than mere reciprocation in kind.

An Eye on the Capital

Confusion still reigns

The snafu caused by the Supreme Court's historic Phillips Petroleum Co. decision of last June 7 continues to be apparent both in the Federal Power Commission here and among legal lights who represent the various companies—producers or distributors.

This is the month in which the Supreme Court may announce whether or not it will accede to a rehearing of the Phillips case. At the same time, the deadline (Oct. 1) for filing of rate schedules by all producers which were selling gas for resale in interstate commerce on June 7. All according to Order 174 and its successor 174-A.

The yelps of the producers still may be heard in every bureaucratic nook and cranny. Numerous protests were filed in August and September by the independent producers and gatherers—more than 100 before Sept. 6, the deadline for filing such protests. All noted various exceptions.

Hearings on the exceptions began Sept. 22 here, and it is expected that the FPC will move promptly, as it has in the recent past, in giving out with a decision. Most of the protests so far concern the commission's action in retroactively rolling back gas prices to June 7, the date of the court's decision, in Order 174 and 174-A.

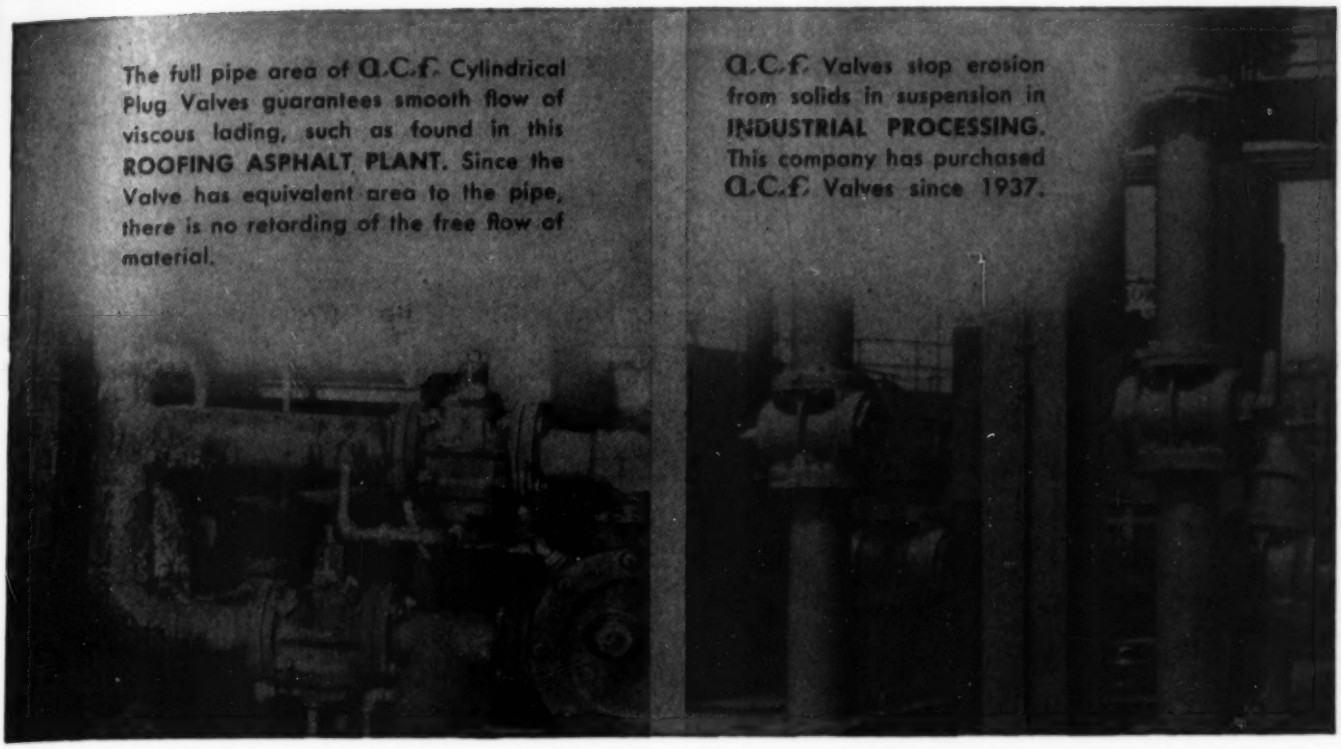
Litigation in the courts between producers and gatherers and the FPC seems certain, unless the FPC, by some strange chance, should back down, or find a face-saving device. The FPC already has said that requests for a stay of the order are "without reasonable justification and must be denied."

Phillips Petroleum Co., whose name seems to figure in every development in the natural gas industry and its FPC troubles, by Sept. 1 filed with the FPC 46 applications for certificates of public convenience and necessity relating to sales under 46 contracts and containing 48 changes in rates. The company asked for a disclaimer of jurisdiction, or, in the alternative, approval of the applications and rate changes.

Company officials, estimating that the first filing represented 20% of the company's contracts for sale of gas moving interstate, filed the 46 applications because they contain tax reimbursement provisions of varying percentages that were to become effective Sept. 1 under the Texas production tax. Phillips planned to file for FPC certificates covering all other contracts subject to Order 174-A by the Oct. 1 deadline.

The applications each contained this statement: "By this application, applicant does not admit that it is a natural gas company or that the sale of gas for which a certificate is here sought is subject to the jurisdiction of the commission. On the contrary, applicant contends that it is not a natural gas company and that the sale herein described is not subject to the jurisdiction of the commission; but applicant makes this application solely for the purpose of complying with Order No. 174-A and thereby avoiding any penalty which

Continued on page 104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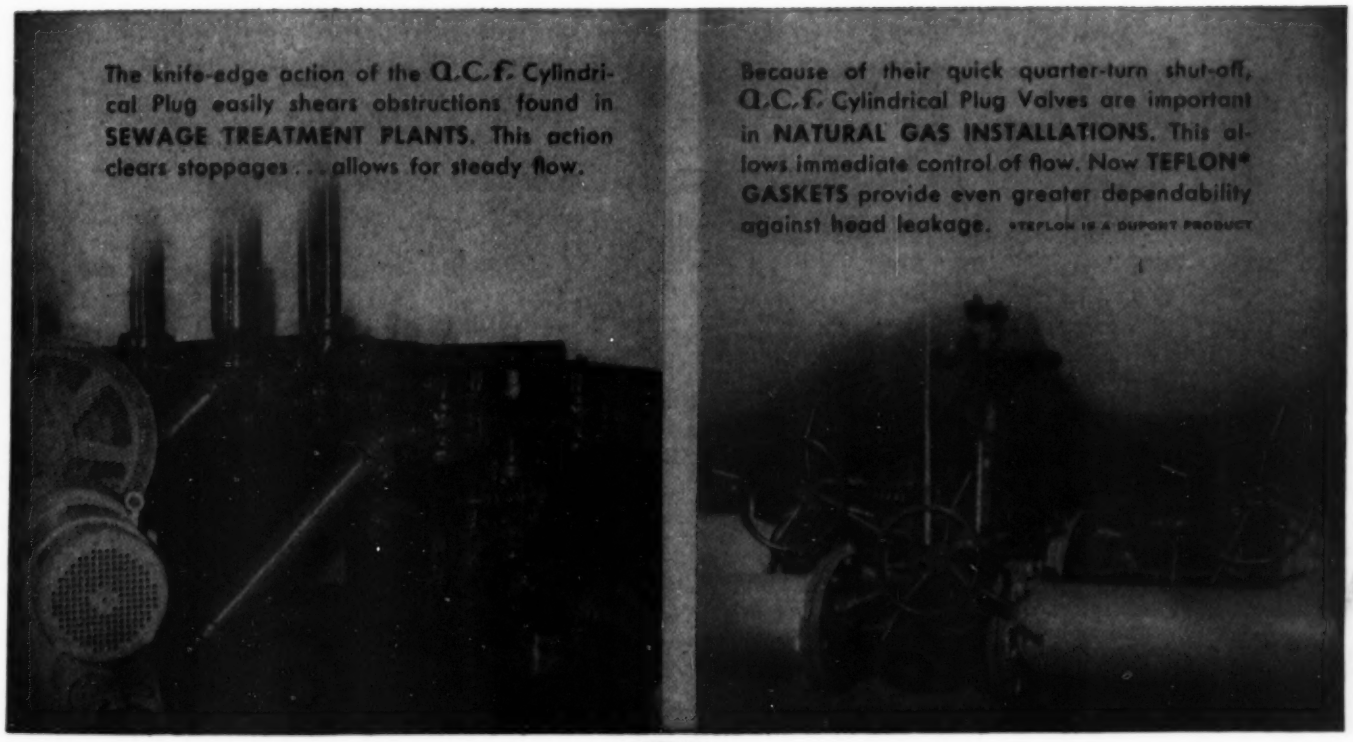
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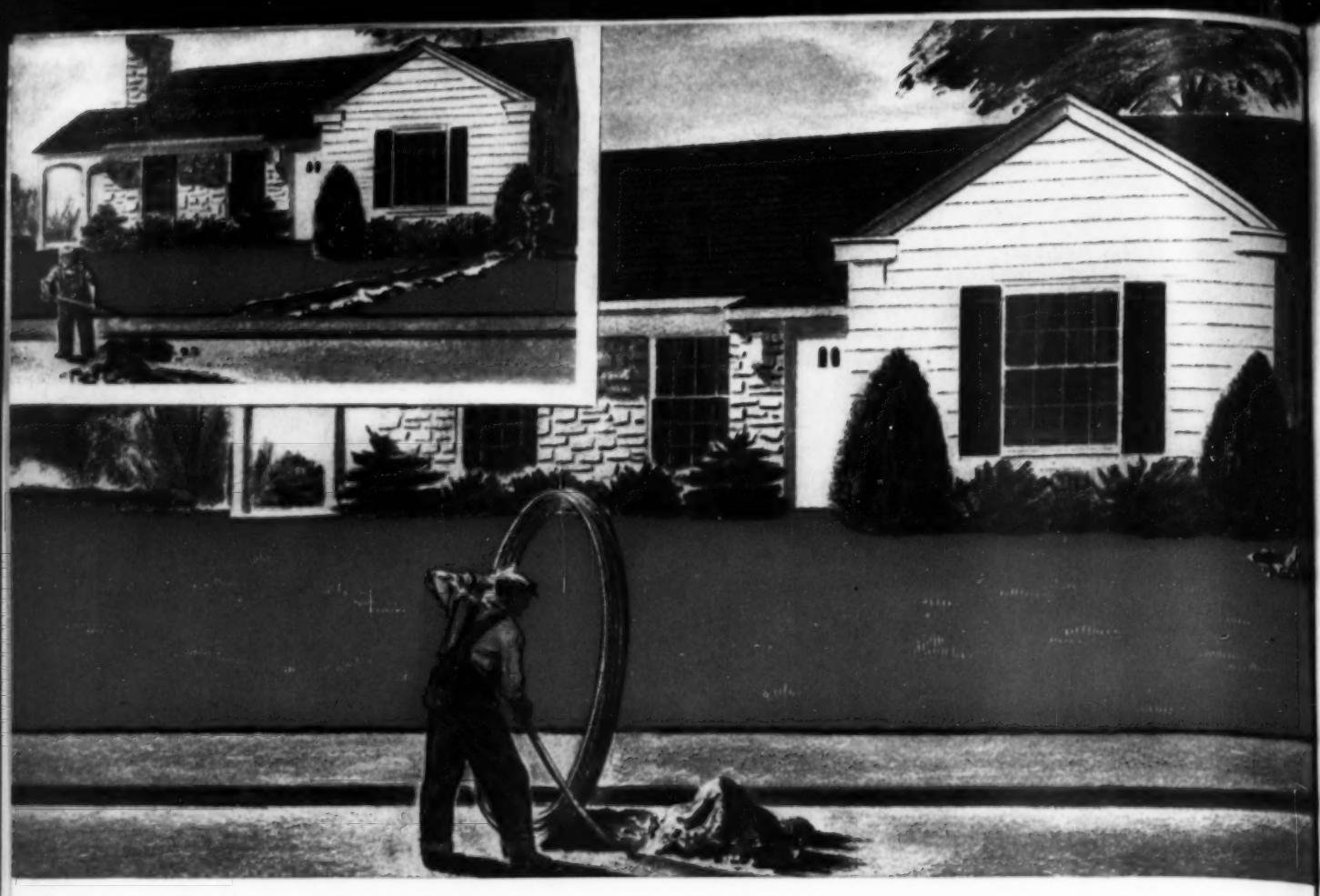

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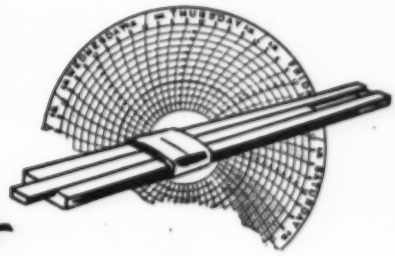
Technical Trends



• By GUY CORFIELD

Coal as gas turbine fuel

An interesting report comes from Great Britain of experiments in the utilization of coal as gas turbine fuel, in an effort to improve the present "regrettable inefficiency" of coal, which is the principal fuel available in the United Kingdom. It is stated that the modern steam turbine power station has a thermal efficiency of about 32% which is close to the ultimate, whereas the gas turbine in its present initial state of development can realize this figure and may soon attain 40% or even 45% thermal efficiency.

The most obvious problem is, of course, the burning of the coal so that the solid portion of the products of combustion will not cause damage to the turbine. One approach is to burn the pulverized coal in a "dry combustion chamber" whereby the combustion products are passed through a cleaner which removes about 75% of the ash. The problem of continuous feed of the pulverized coal is being worked out and observations of the effect of the remaining fine ash on the turbine blades will establish permissible concentrations for practical operation.

Another approach is to burn at such a temperature that the ash melts and is retained in the combustion chamber. The granulated coal is introduced with a swirl so that it burns on the walls of the combustion chamber with adherence of about 90% of the ash (which is withdrawn as slag) so that only the finest particles of ash escape into the turbine blade enclosure. Coals with 20% ash content have been used and a 2000 KW gas turbine electric generating plant is in design. A third approach is to make the coal into gas, clean the gas, and then burn it; design efforts are being aimed at a gas producer that will generate gas at the cycle pressure of the turbine, which is 6 atmospheres.

Experiments are even being conducted on the use of peat as gas turbine fuel. One of the principal problems is removal of water from 90% down to about 30% at which it will burn. It is being approached by a combination of press squeezing, and use of the turbine exhaust heat. Fluidizing the peat into an air stream, for transport into the combustion chamber, is also being studied. Results have been sufficiently successful to plan some trial runs in a complete plant.

These experiments should be of interest to combustion engineers in terms of the flexibility and adaptability of the gas turbine, and the possibility of using solid fuels and low grade fuels at practical efficiencies.

Miniature high capacity thermal sensitive electric switch

MiniTec, 5423 Delaware Ave., Los Angeles 41, Calif., has developed a chemical-type thermal switch marketed under the trade name of MiniTherm. It is 3/16 in. in diameter and 3/16 in. long. Below a predetermined switching temperature the resistance of the MiniTherm exceeds 10 megohms. When the MiniTherm reaches its switching temperature, the resistance becomes permanently less than 0.10 ohms. Current rating is 5 amps, a-c or d-c, continuous duty. MiniTherms are available at switching temperatures from 150° F to 400° F in increments of 25°, and from 400° F to 1000° F in increments of 50°. Accuracy is plus or minus 2%. The extremely small mass of the MiniTherm permits it to follow temperatures rising at the rate of 100° per second, and it operates under extreme vibration or shock. Very low temperatures do not alter the operating point. High power capacity permits controling solenoids, motors, etc., directly. Strong, stable telemetering signals are obtained without any need of d-c amplifiers.

The Minitherm is in the form of a small cartridge which is easily replaced. It has only four parts—an external electrode, a ceramic insulator, a center electrode, and the thermal sensitive chemical. The electrodes are cadmium plated brass. This switch can be mounted in spring contacts that can vary in spring pressure from 4 oz to 5 lb. It is obvious that it can be used for a variety of purposes such as providing a warning signal, or starting or stopping flow, or instituting other desired motion, when a specified temperature has been reached. These MiniTherms cost from $1.80 to 99 cents each depending on the quantity purchased. Spring holders of high tensile stainless steel can also be purchased at $1 to 70 cents depending on quantity.

Survival barrier

The Armed Forces Chemical Association has revealed the development of a "diffusion board" which can be used as a construction material for shelters for protection against toxic gases. It is stated that this board will protect groups sheltered by it from all known chemical and biological warfare agents and will also furnish some degree of protection against radiological agents.

It is quite inexpensive, looks like ordinary fiber board, and is similar in base but contains charcoal and other components. An enclosure constructed of it will permit the passage of pure air inward, and carbon dioxide outward, by one-way diffusive action. One square yard will provide breathable air for one man and occupancy within its protection could be safe for extended periods. It would seem that such material could well be used to enclose critical operating centers where essential services could be maintained during warfare and emergencies.

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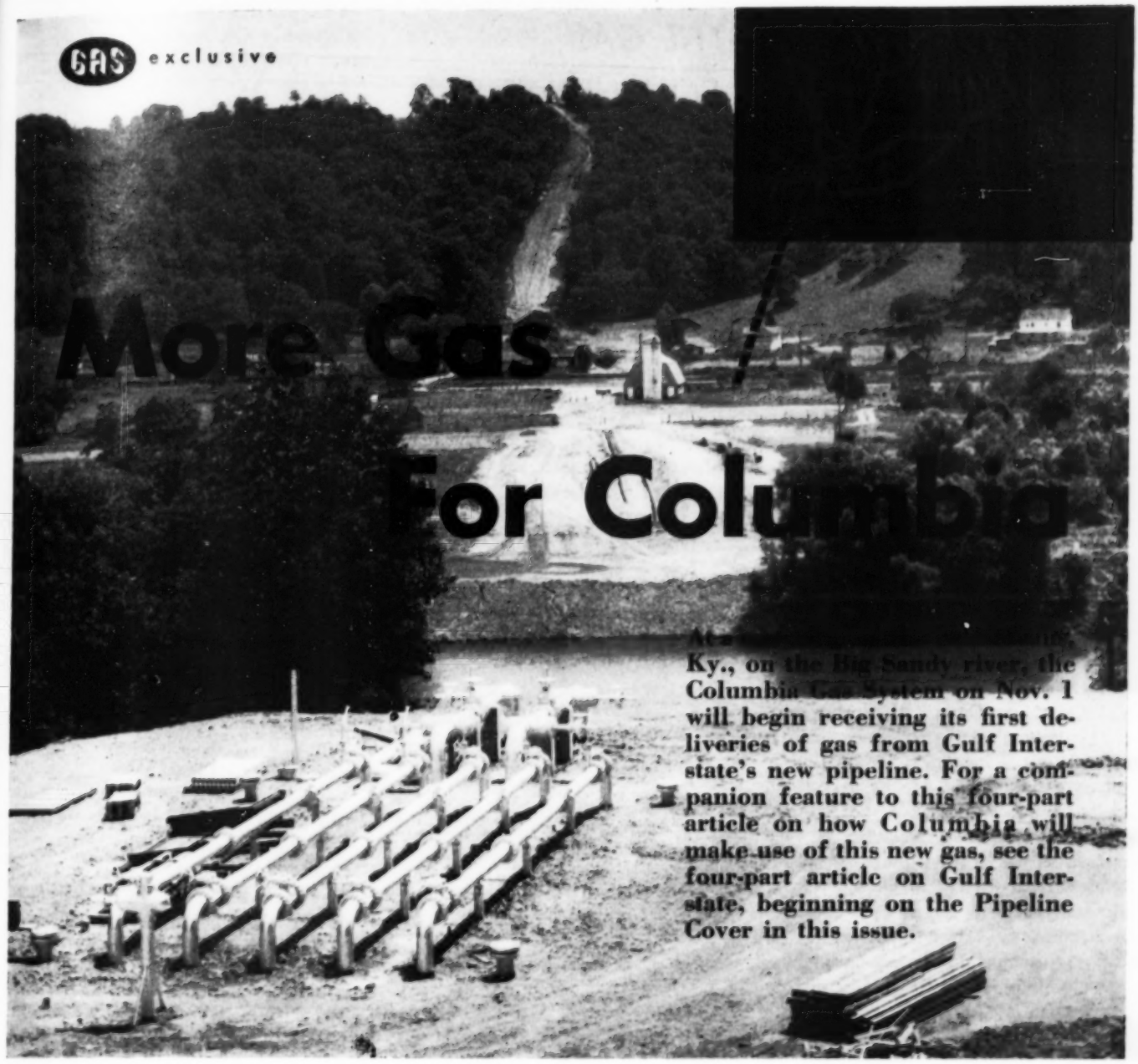

More Gas ... / For Columbia

At [illegible] Ky., on the Big Sandy river, the Columbia Gas System on Nov. 1 will begin receiving its first deliveries of gas from Gulf Interstate's new pipeline. For a companion feature to this four-part article on how Columbia will make use of this new gas, see the four-part article on Gulf Interstate, beginning on the Pipeline Cover in this issue.

Part 1

Why more Southwest gas is so essential to the system

"Space Heating Gas Available To Anyone"

"Applications of Home Owners For Gas Heat Approved"

"Gas Supply Hike Looms"

HEADLINES like those appeared this spring in scores of newspapers throughout the seven-state territory served by the Columbia Gas System.

But no newspaper headline could quite portray the years of perspiration, drudgery and imagination involved in meeting the tremendous demand for natural gas in the mid-Appalachian region. Nor could the average newspaper reader visualize the extent of the work required to bring this increased supply of natural gas to his burner tip.

Columbia Gas System today is en-

In Four Parts

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IN 1953, 74% OF THE GAS CAME FROM THE SOUTHWEST

gaged in the biggest construction program in its history. Before the year is over, more than $100 million will have been spent in building hundreds of miles of transmission and distribution lines, adding thousands of compressor horsepower, and drilling scores of production and storage wells.

Before going into details, it will be helpful to see just what Columbia Gas System is, and to examine the situation that made the record construction program necessary.

14 companies in system

Fourteen operating gas companies, all integrated and interconnected, make up the Columbia Gas System. These gas companies, serving some 2.5 million families, are organized for administrative purposes into three groups, with headquarters at Charleston, W. Va., Columbus, Ohio, and Pittsburgh.

The System's territory lies entirely within what is known as the mid-Appalacian area. Here, the first natural gas was produced commercially in this country. The System obtains much of the gas which it transports and distributes from its own wells and from those of independent producers in this area.

But coming into the Appalachian area are a number of long distance pipelines, which are also important sources of supply for Columbia companies. Just how important those Southwest pipelines are can be judged by noting that in 1953 they provided the System with 74% of all the gas it sold. The significance of that statement is especially underscored by the fact that until 1943 Columbia was able to meet all of its requirements from Appalachian production.

So, in the relatively short space of 10 years, demand for natural gas in Columbia's territory—once the nation's richest gas producing area—had grown to such an extent that nearly three-quarters of the gas Columbia sold had to be imported from another section of the country.

What was behind this constantly growing demand?

Householders recognized that gas is the cleanest and most convenient fuel they could use, and industrialists found that its temperature is controllable to within a few degree. In addition, this remarkable premium fuel is being served at regulated prices—prices that are, in many areas, lower than the prices of oil and coal. It is not surprising that more and more people want natural gas.

Had to look elsewhere

As the demand grew, and as existing pipeline companies were not willing to increase their commitments to Columbia, it became evident that the System would have to look elsewhere for additional supplies, and for the means to get those supplies to its market area.

In the meantime, to protect service to its existing customers, the various companies in the System were forced to ask that state regulatory bodies impose restrictions on the use of gas for space heating and for new industrial purposes. Those restrictive orders were distasteful to Columbia, to its customers, to the regulatory bodies, and to the businessmen who manufacture, distribute, sell and service heating equipment.

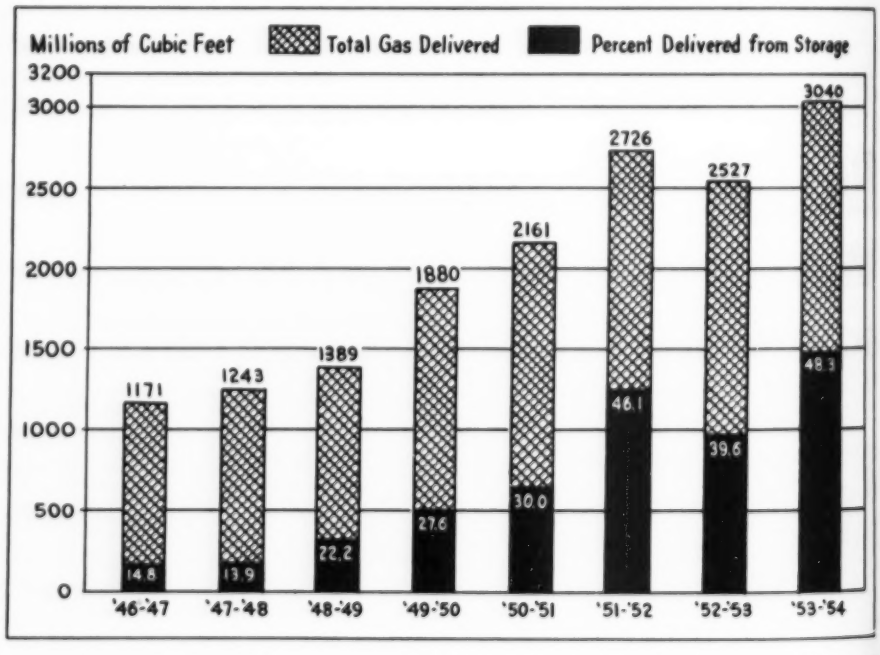
The logical place to look for new supplies was the Southwest. About three years ago, a vice president of the Columbia Gas System Service Corp. was given the responsibility of finding a new gas supply in that area. At about the same time, Columbia was having discussions with various people concerning transportation of the gas—if Columbia got the supply.

It would be impractical to relate in an article of this length the details of the events that followed, but Columbia's efforts were successful. On Feb. 21, 1952, the Gulf Interstate Gas Co. was formed. It is an entirely separate company not affiliated with Columbia.

By September 1952, Columbia had succeeded in negotiating contracts on behalf of its Charleston subsidiary, United Fuel Gas Co., for a gas supply totaling over 2 trillion cu ft. That's enough gas to insure a delivery of 300 million cu ft a day for approximately 20 years and enough to justify construction of the 30-in. Gulf Interstate line.

21 contracts signed

Those initial negotiations involved the signing of 21 separate contracts with 14 major producing companies and dozens of minority owners in southern Louisiana. The contracts are for gas in 16 different fields. Columbia particularly wanted Louisiana gas because, as Southwest gas goes, it is closest to Columbia markets, because geological studies indicate abundant re-



Percent of total gas deliveries that came from storage on peak days for winters 1946-47 through 1953-54 together with the gas delivered on peak days during winters in millions of cubic feet.

TABLE 1. WHERE THE MONEY GOES

For transmission facilities	$54,340,410
For gas storage facilities	21,703,475
For production and gathering facilities	9,242,400
For distribution facilities	18,664,335
For gas property	2,821,292

serves there, and because certain contracts could be negotiated with a flexibility of supply which is well suited to Columbia's needs.

In addition, gas from Gulf Interstate has permitted the Columbia System to revamp its supply network to the extent that deliveries from current suppliers can be more efficiently handled. In effect, this has resulted in the more efficient use of gas currently supplied to the system from other pipeline companies. Gas taken from other southwestern transmission lines, for instance, will in the future be delivered to a more suitable location in the network. The total result will be a more fully integrated system; with supply lines, storage and producing fields fitting together to offer the system's customers, and potential customers, a better service.

The details of Gulf Interstate's formation and construction are chronicled elsewhere in this issue. It is sufficient to say here that a target date of Nov. 1, 1954 was set for deliveries to begin, and that the date is being met. Assurance of gas deliveries through Gulf Interstate by Nov. 1 played a large part in enabling Columbia to announce that System companies will, in general, be able to serve gas for space heating to all who want it in the System's market area.

Completion of Gulf Interstate means an increase in Columbia's firm gas supply of about 30%. Columbia's existing facilities could not handle an increased load of this magnitude.

Estimates indicated that on the peak day of the 1954-55 winter, the System would be required to handle approximately 3.9 billion cu ft, based on a design temperature of minus one degree. Last winter's peak day occurred Jan. 12, when the System mean temperature was 14° and the total sendout was approximately 3 billion cu ft.

After extensive studies and surveys, a construction program totaling $114 million was arrived at, which would provide the minimum of facilities needed to handle this additional gas. This expenditure was divided among the various types of facilities as shown in *Table 1*.

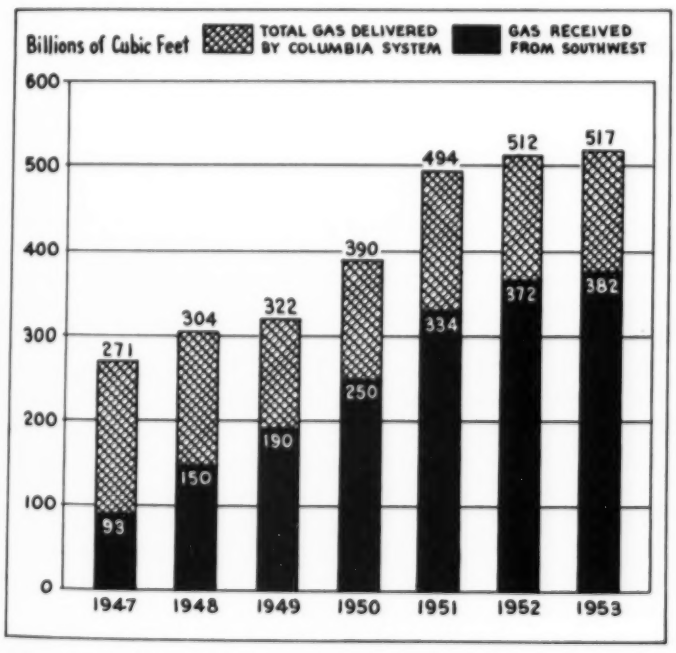
123,000 job orders

This year's expansion program, alone, is estimated to require a total of over 123,000 individual job orders. The work is estimated to require some 9000 men by approximately 40 outside contractors. New transmission facilities to be added during the year will require over 128,000 tons of pipe, casing and tubing. A total of 37,305 compressor horsepower is to be added.

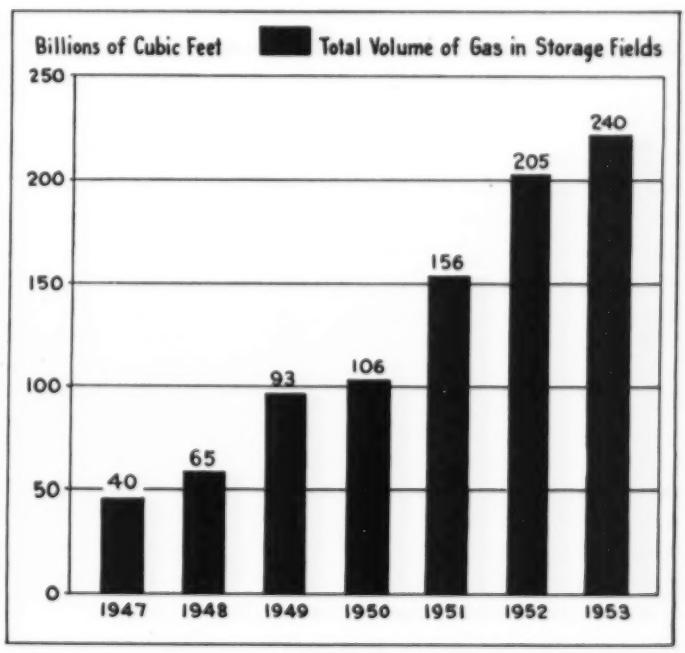
Storage is vitally important to Columbia because it enables System companies to purchase gas at approximately uniform daily quantities throughout the year. During the summer when demand is relatively low, gas is stored in fields near market areas. This gas is then available for delivery to market during the peak demands of the following winter.

At the end of 1953, Columbia had 240 billion cu ft of gas stored underground. That was one-third of all the gas held in underground storage in the United States. On a peak day, as much as 50% of the System's sales are met with gas from storage.

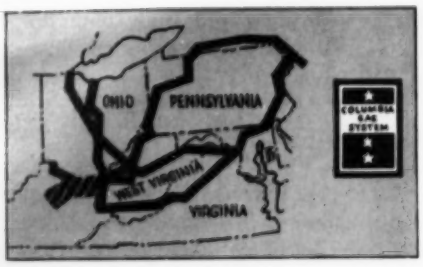
There, briefly, are the answers to the Columbia Gas System's supply problems—at least for now—additional supplies acquired in the Southwest, their delivery by Gulf Interstate, and increased underground storage.



Gas received from Southwest in billions of cubic feet and total gas delivered by Columbia in billions of cubic feet.



Total volume of gas in storage fields in billions of cubic feet at Dec. 31 of each year.



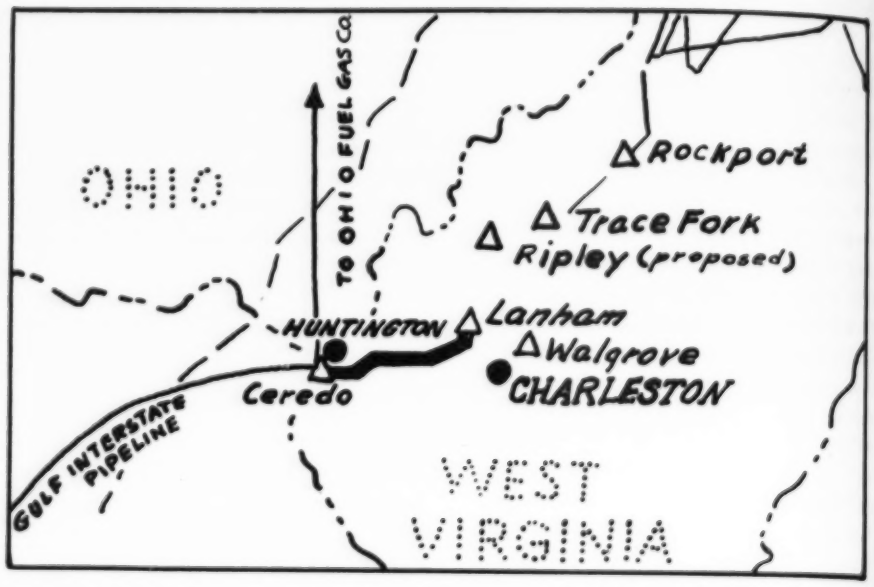
Part 2

United Fuel plays the role of middleman for the system

GAS staff report

THE United Fuel Gas Co., hub of the Columbia Gas System gas supply network, has the task of receiving, storing and distributing major portions of the new supplies of natural gas that have been made available to the Columbia's Gas System companies through the completion of the Gulf Interstate transmission line.

The bulk of the gas transported by Gulf Interstate for Columbia is delivered to United Fuel Gas Co. at the Kentucky-West Virginia border near Huntington. An additional quantity is delivered to the Central Kentucky Natural Gas Co., one of United Fuel's sister companies in Columbia's Charleston Group, about 75 miles southwest of the line's border terminus for delivery to Cincinnati and cities in Kentucky.



From the Big Sandy measuring station, the United Fuel line runs to Ceredo compressor station for transport to other points in the system.

$34 million financing

Columbia's Charleston Group companies, and the United Fuel Gas Co., in particular, therefore, have a major portion of the construction that will be undertaken to handle the system's new supplies of natural gas. In fact, in a statement by John W. Partridge, United Fuel Gas president, earlier this year he estimated that the company would build during 1954 facilities that would require financing of $34 million.

The largest single item in United Fuel's construction program is a 58-mile long, 30-in. line which links the northern terminus of the Gulf Interstate line with the company's transmission network. This line, including a crossing of the Big Sandy river, has involved an expenditure of $6,683,000. Major additions to the company's compressor facilities include the new 6000-hp Ceredo station, about four miles north of the Gulf Interstate terminus on the new 30-in. line in West Virginia and a 3300-hp addition to Lanham compressor station, north of Charleston.

The development of additional gas storage facilities, along with the necessary compressor horsepower, has also been undertaken in fields north of Charleston. Lines into storage fields are also planned and under construction. Estimated 1954 expenditures by Charleston Group companies for storage facilities amount to $10,227,700.

Atlantic's plans

Atlantic Seaboard Corp., another of the Charleston Group companies, plans to loop several sections of its 26-in. line which extends over 262 miles from Cobb compressor station in West Virginia to Rockville, Md. Total cost of this project, which includes increasing the horsepower at two existing compressor stations, is approximately $10 million.

Considerable additional construction has already been completed by the Charleston Group companies to handle new supply of gas. Nearly 30 miles of 20-in. line, for example, was installed between Lanham and Cobb compressor stations in 1950. In fact, expansion of all of the Columbia companies has been going on steadily during the past few years to make ready for new gas supplies which they would be required to handle.

The new 58-mile link between Gulf Interstate's northern terminus at the Big Sandy river on the West Virginia-Kentucky border and United Fuel's transmission network is West Virginia's first 30-in. pipeline. The new line, being built by H. C. Price Co., is scheduled for completion this fall.

Where it connects

The line connects to the Gulf Interstate line just a mile south of the Leach measuring station on the Kentucky side of the Big Sandy river. The Big Sandy river crossing, one of nine on the line's 58-mile length, is made in three 20-in. lines. The 30-in. also crosses Kanawha river in three 20-in. lines. In addition, the line makes five railroad crossings

and seven major road crossings. The winding Pocatalico river is crossed four times.

From the Big Sandy river the line passes the new Ceredo compressor station, where part of the gas may be dispatched in another line north across the Ohio river to supply gas to the Ohio Fuel Gas Co., another of the Columbia Gas System companies.

Terminus for the new 30-in. line is United Fuel's Lanham compressor station located 12 miles northwest of Charleston.

Ceredo station

Ceredo compressor station, built by J. F. Pritchard & Co., and designed similar to the Gulf Interstate stations, will be ready for use by Nov. 1, when Gulf Interstate begins the delivery of gas. Function of the new $2,393,500 station is to move gas on to United Fuel's customers as well as to sister companies of Columbia and to wholesale customers.

The station is powered with three 2000-hp Cooper-Bessemer GMWA engines. Unitized design which makes use of a cooling fan that is hydraulically driven from the compressor engine, and many semi-automatic and remote control features make the station a near duplicate of the Gulf Interstate stations. Automatic operation of station and compressor engine valves is the same as that incorporated in the Gulf Interstate design. (See transmission section story on Gulf Interstate.)

Versatile piping setup

Station piping is so designed that compressor suction may be taken from either the 30-in. line carrying Gulf Interstate gas or from a nearby United Fuel Gas Co. 20-in. line which presently transports gas purchased from Tennessee Gas Transmission Co. (See *Fig. 3.*) Discharge may be made into either the new 30-in. line north to Lanham or across the Ohio river to Ohio Fuel Gas Co. to provide a complete interchange of gas as required by demand. It is, of course, also possible to bypass the station with either or both of the lines.

Suction is taken from either of the incoming lines into a 24-in. station header through a pair of Aerotec scrubbers. A 24-in. discharge header feeds either of the two lines through a parallel bank of four 12-in. check valves. A

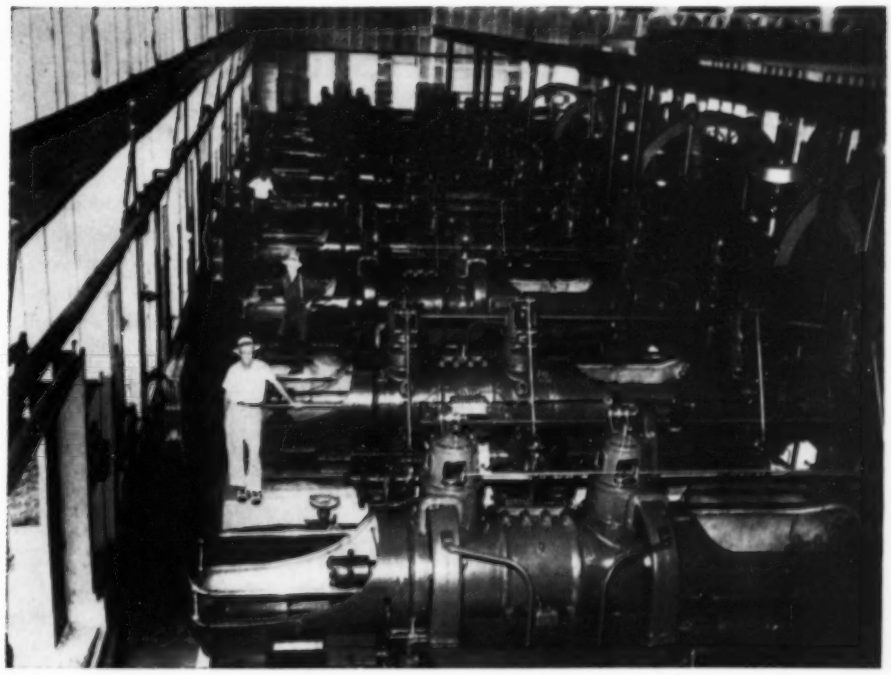


Fig. 2. Four compressor engines now at Walgrove station may be moved to a new station to be constructed at Ripley, W. Va. These engines, 1000-hp Cooper-Bessemers, have been in service at Walgrove for 30 years.

Foxboro control valve is used across the discharge line valve between the two main transmission lines.

Operating air

A pair of Worthington air compressors supply the station valve operating air. Two Ideal, 156 KVA, AC generators supply station power.

Lanham compressor station, located at the northern terminus of West Virginia's first 30-in. line, has equally versatile station piping. Gas may be sent out from the station in several different directions depending upon where it is needed for Columbia's pooled supply. Gas can be dispatched through Lanham into other lines for eastern markets or north into United Fuel's newly devel-

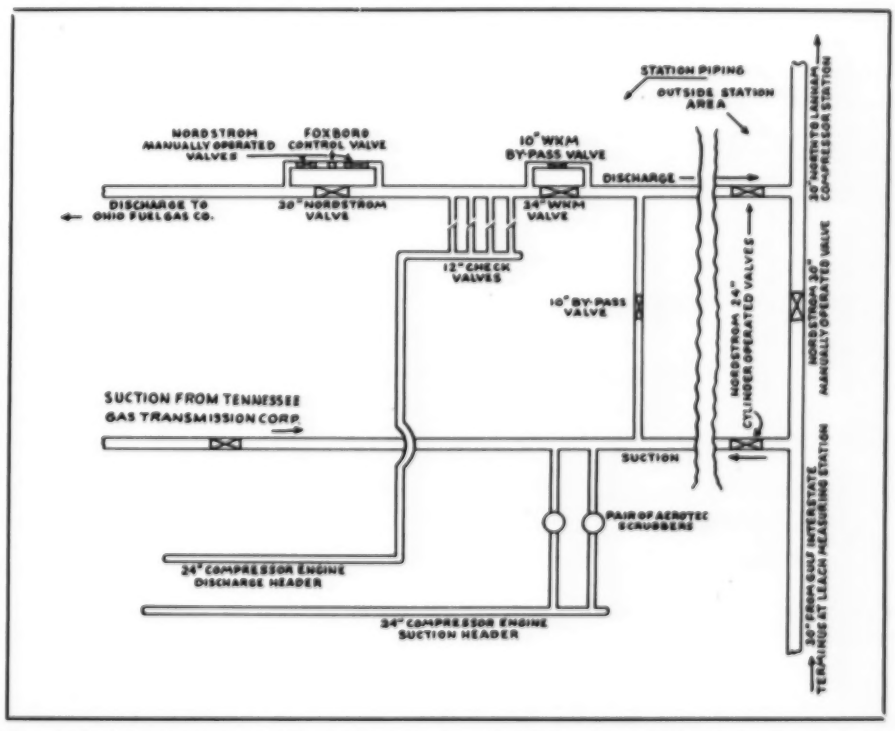

STATION PIPING
OUTSIDE STATION AREA
NORDSTROM MANUALLY OPERATED VALVES
FOXBORO CONTROL VALVE
10" WKM BY-PASS VALVE
DISCHARGE
DISCHARGE TO OHIO FUEL GAS CO.
30" NORDSTROM VALVE
24" WKM VALVE
12" CHECK VALVES
10" BY-PASS VALVE
NORDSTROM 24" CYLINDER OPERATED VALVES
NORDSTROM 30" MANUALLY OPERATED VALVE
30" NORTH TO LANHAM COMPRESSOR STATION
SUCTION FROM TENNESSEE GAS TRANSMISSION CORP.
SUCTION
PAIR OF AEROTEC SCRUBBERS
24" COMPRESSOR ENGINE DISCHARGE HEADER
24" COMPRESSOR ENGINE SUCTION HEADER
30" FROM GULF INTERSTATE TEE-LINE AT LEACH MEASURING STATION

Fig. 3. Design of station piping at Ceredo gives flexibility of operation through alternate flow arrangement.

30-YEAR OLD COMPRESSORS TO BE RENOVATED AND MOVED

oped storage fields. Also, gas can be dispatched north to Pennsylvania and Pittsburgh group companies.

Doubled compressors

Compressor complement at Lanham is being doubled to handle the new load. Presently equipped with three 1100-hp Cooper-Bessemer engines, an additional three GMVA engines are being added. Construction work is being done by the Dravo Corp., the contractors who built the original station. The three new engines will have separate suction and discharge headers.

A new 24-in. line extending 35 miles north from Lanham compressor station to the site of the proposed Ripley compressor station and storage field is now under construction. An additional 18 miles of 20-in., to extend the line to Rockport station and storage area, will be undertaken next year. Both the 4000-hp Ripley station and the 3000-hp Rockport station are scheduled for completion by June 1, 1955.

The two new underground storage pools located at Ripley and Rockport underlay a total of approximately 25,800 acres. Both are in depleted gas pools at a depth of about 5200 ft.

The Rockport and Ripley stations are of particular interest because of two unusual aspects of their construction. For one thing, United Fuel proposes to use its own personnel in the construction of Rockport station. Also, portions of both stations' equipment, including compressor engines, will be taken out of older existing stations and modernized for installation in the new service.

Modernizing engines

The United Fuel Gas Co., because of its location in former extensive gas producing areas, has long been one of the major producers of gas for the Columbia System companies. However, with the depletion of certain of these producing facilities and the fact that more and more of Columbia's gas is coming from the southwest, the company has found some of its stations and portions of its network at considerably less than capacity.

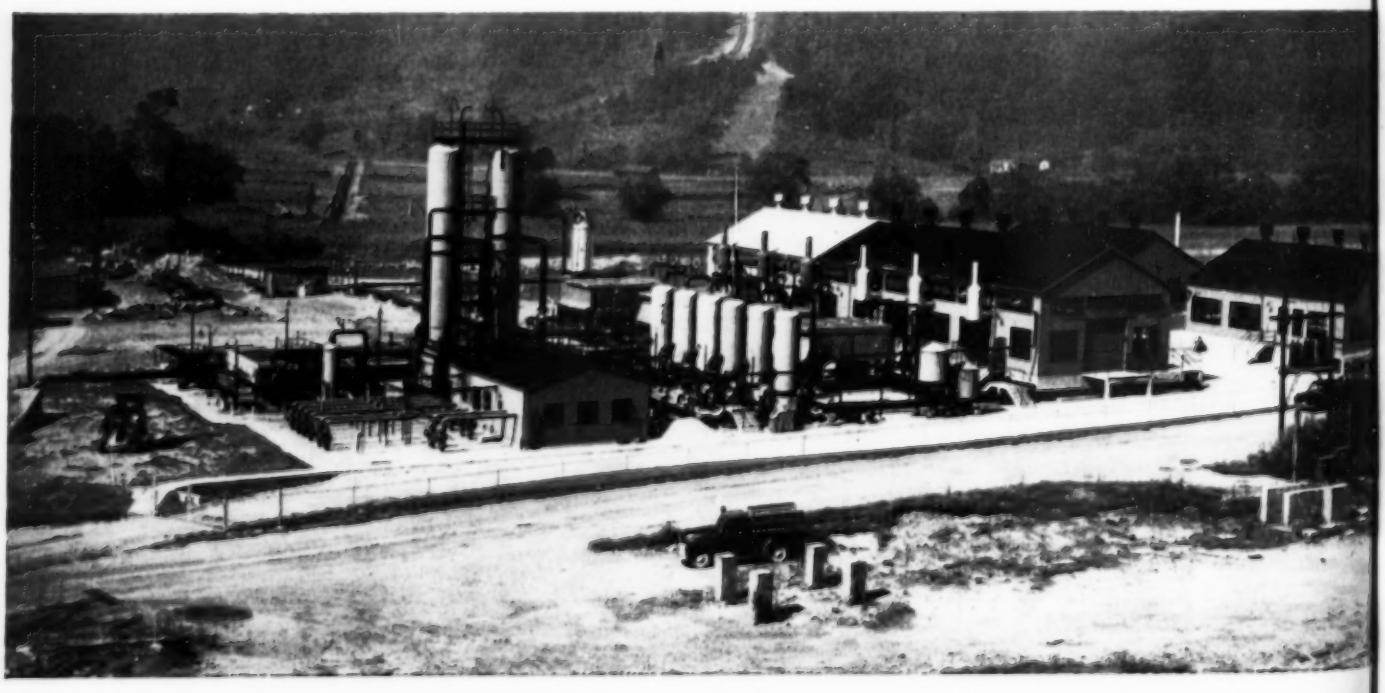
The company chose to take several twin-tandam horizontal Cooper-Bessemer engines which have been in service as long as 25 to 30 years, and which are not now needed in their present service, and modernize them for use in the new Rockport and Ripley stations. Two 1000-hp horizontals will be removed from United Fuel's Lewis station and one will be taken from their Trace Fork station. Four additional horizontals will be taken from the Walgrove station. In being re-installed at Rockport and Ripley they will be remodeled and put into operation in a standard station design.

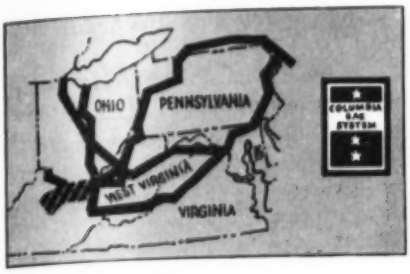
Atlantic to loop

Atlantic Seaboard Corp., still another Charleston Group company, plans to loop several sections of its 26-in. line which extends over 262 miles from Cobb compressor station in West Virginia to Rockville, Md. Looped sections will be approximately 80 miles. Pipeline workers who built the original 26-in. line in 1949 nicknamed it the "Toughest Inch," because of the rugged section of the Allegheny mountains it crosses.

Total cost of the project, which includes increasing the horsepower at two existing compressor stations, is approximately $10 million. The increased compressor horsepower includes an additional 1100-hp at the company's Cleveland compressor station, and a 2200-hp addition to its Lost River station, both in West Virginia. It also includes looping a 14-mile section of its 20-in. line east of Rockville, Md. This line extends 421 miles from Kentucky to the Maryland-Pennsylvania border.

Fig. 4. At Lanham compressor station, 14 miles from Charleston, three new Cooper-Bessemer GMV engines were recently added. Lanham is one terminus of the new 30-in. line, which extends from Ceredo station.

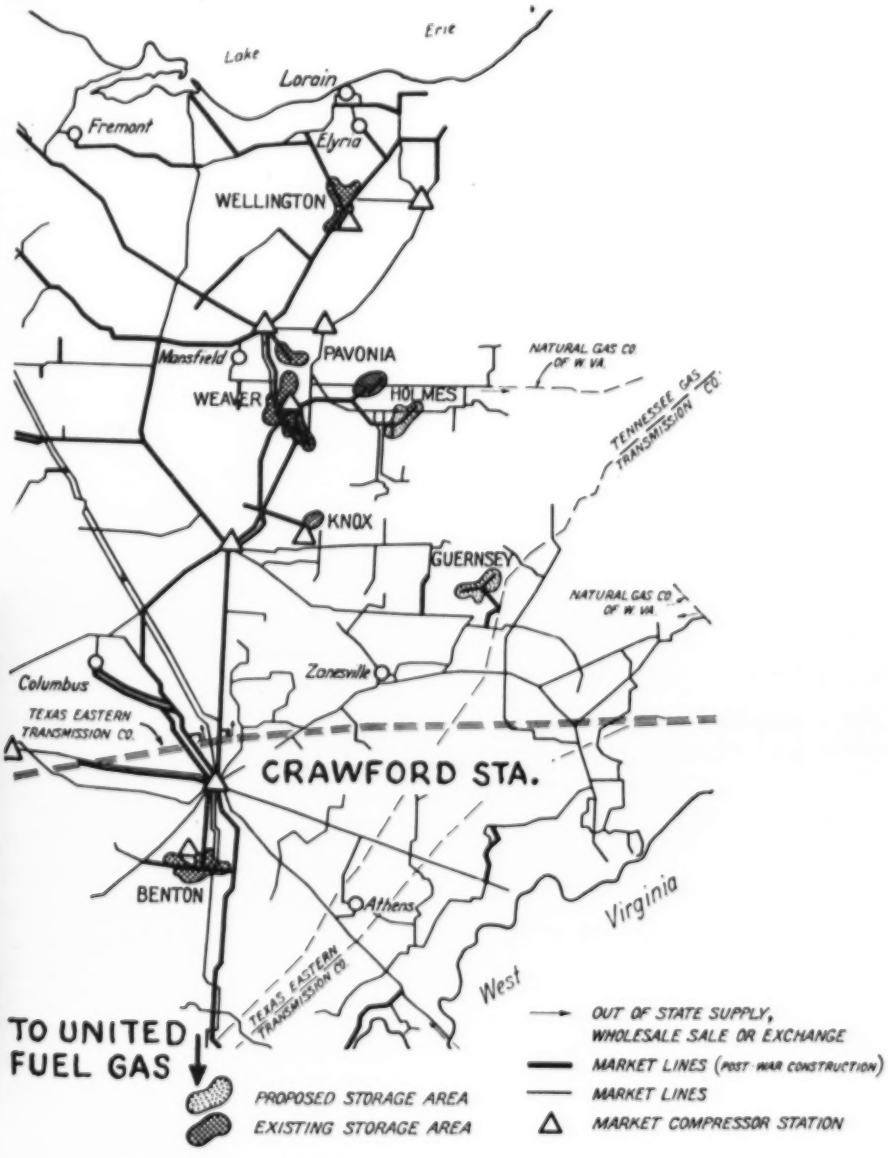




Part 3

Ohio Fuel prepares for new gas with largest construction program in history

THE Ohio Fuel Gas Co., one of the major distribution units in the Columbia System, will wind up the year with total expenditures estimated at $33 million for the biggest building program the company has ever undertaken. This expenditure will be divided among the company's facilities with $10.5 million to be spent on distribution systems in the 364 communities served by Ohio Fuel Gas, $13.9 million on big pipelines, compressor stations and other transmission facilities, and $7.4 million on underground storage and production of gas. An additional $1.2 million will be spent on general properties such as radio equipment, trucks and pipe laying equipment.



The maze of lines that is the Ohio Fuel Gas network is being added to with the new $33 million program now nearing completion.

Two miles per day

It is estimated that Ohio Fuel workers and outside pipeline contractors will during 1954 be laying pipe at the rate of almost two miles a day to complete about 400 miles of new lines. The building program will require about 1400 railroad car loads of pipe and some 200 carloads of coating and wrapping material to be placed on the pipe for corrosion prevention.

According to A. W. Lundstrum, Ohio Fuel president, the program will, for the first time in seven years, put the company in position to deliver gas to virtually all homes on the company's lines.

Largest share for pipelines

Major portion of the total $33 million expenditure ($13,900,000) will be for big pipelines, compressor stations and other facilities for the transmission of gas to the company's market areas. Largest of these projects is 46 miles of 24-in. and 20-in. line from a point near Jackson, in southern Ohio, to Crawford compressor station, southeast of Columbus, at a cost of $3,110,000. This line will parallel part of an existing 20-in. line from the Ohio river to Crawford station. The new line will help bring more gas into the Ohio Fuel system from United Fuel Gas Co.—the com-

FACILITIES FOR INCREASED SUPPLY SPREAD THROUGHOUT OHIO SYSTEM

Coating and wrapping machine at work on new 20-in. line built by Ohio Fuel from Hooker to Gahanna at a cost of $1,640,000.

pany that will receive the Gulf Interstate gas—by connecting into United Fuel's newly built Ceredo, W. Va., compressor station. (See United Fuel Gas article.) This line is currently under construction.

Gas from Big Inch

Already completed is 34½ miles of 20-in. line, extending from Hooker, near Crawford station, in the direction of Columbus and then in a northeasterly direction to Johnstown. The cost of this project was $1,640,000. In the summertime this line will help take more gas from Texas Eastern Transmission Corp.'s "Big Inch" and "Little Inch" lines at a connection at Hooker. It will also be used to transport gas from Crawford station to the Weaver, Pavonia and Wellington storage areas in the northern part of the state. In winter the line will help bring more gas into Columbus and to central Ohio markets.

Also currently under construction is 10.4 miles of 20-in. line from Benton storage fields south of Columbus to Crawford compressor station. This line, estimated at $656,000, will provide additional capacity to deliver gas in and out of storage. It will have a peak day deliverability of 35 MMcf of gas.

Three projects, planned for completion this fall at a total cost of about $2,714,000, are planned to increase the delivery of gas to Toledo, Findlay, Fostoria, Bowling Green, North Baltimore, and other northwestern Ohio towns. One of these is 24.5 miles of 20-in. from Weaver storage area, in north central Ohio, to connect with existing lines at Leesville to the northwest. Another is 21.5 miles of 18-in. and 20-in. from New Riegel, in Seneca county, to the vicinity of North Baltimore, south of Toledo. These lines have already been completed. A third line is 19.2 miles of 16-in. line from North Baltimore north to a point north of Bowling Green, replacing an existing 10-in. line.

Final link

The recent completion of 14.4 miles of 20-in. line east from Mt. Sterling closes the final link in a line which parallels one of Ohio Fuel's main transmission lines between Crawford station and Howell regulating and control station near Cedarville in Greene county. This link, costing $670,000, will improve service to Springfield, Urbana, Dayton, and other western Ohio towns.

The addition of 3000-hp to the company's Crawford compressor station is currently underway at an estimated cost of $722,700. A new building will be constructed to house the compressors, cooling equipment and auxiliary facilities.

An additional $171,510 is being spent for rehabilitation work at Crawford station. Included are changes in the station piping system, installation of a new cleaner and a complete change in the electrical system.

Improvements in Columbus

Major portions of the company's $10.5 million to be spent for distribution facilities are for improvements in Columbus and Toledo, the two largest cities served by Ohio Fuel. In the Columbus area where expenditures will total $2.5 million a new supply line has been built into the city and a new town border station has been constructed. About seven miles of 24-in. line has been laid in this project. Service will also be extended to the North Linden area, northeast of Columbus, this fall. About a mile of 10-in. pipe will be laid to deliver gas to the area, and about 10 miles of smaller lines laid within the community.

String of 20-in. pipe is shown along 34-mile right-of-way in Franklin county.

Also in the city of Columbus, about 1½ miles of line feeding the eastern part of the city has been replaced with new and larger lines. Two projects have been completed to improve service in the Upper Arlington area, northwest of

Columbus and a new feeder line has been built to Westerville, north of the city.

New housing service

Work is underway on a project to extend gas service to a new housing development at Lockbourne Air Force Base southeast of Columbus. More than four miles of pipe is being laid in this project. A total of more than 90 miles of small diameter pipe will be laid in the district to extend service to new customers and for replacements. An estimated 5500 meters will be installed in the Columbus district during 1954.

In the company's Toledo district a total of $1,403,420 will be spent on distribution facilities. A major portion of this budget will be spent for increasing the capacity of supply lines into the Toledo area by replacing feeder lines with larger diameter lines.

Expansion within the city of Toledo includes the extension of service to the Trilby community, northwest of the city, by laying about four miles of line of various sizes, and the conversion of a northside area from low to intermediate pressure by installing 2355 service regulators at homes in the area. About 46 miles of pipe will be laid in the district to extend service to new customers and for replacements. An estimated 1920 meters will be installed in the Toledo district during 1954.

The company expects to spend an estimated $7.4 million this year on storage and production facilities with a major portion of the amount, about $4.6 million, going for the all-important storage facilities. Of this expenditure $2,322,500 will be used to double the size of the company's Holmes storage field. The new field will have an ultimate capacity of about 8.5 billion cu ft. The expansion program at Holmes includes construction of a compressor station with four 1500-hp compressor engines, water cooling and auxiliary equipment. The company will spend $1,785,000 for this part of the program. Ten miles of pipe will be laid to connect storage wells and measuring equipment.

Storage

An additional $847,000 will be spent to develop a new storage field north of Cambridge to be known as Guernsey storage project. This field, which underlies some 8000 acres, will have a capacity of 4.7 billion cu ft. Work currently underway includes laying about 30 miles of pipe in the storage field, installation of the piping at the compressor station site and installation of measuring equipment. Of this total amount $297,800 will be spent for a compressor station building, two 440-hp compressor engines and station piping.

New wells

Additional storage wells are to be drilled in the company's existing fields at a cost of $1,455,200. This amount is for drilling a total of 99 wells at the company's Benton, Weaver, Pavonia, and Holmes fields.

Miscellaneous expenditures totalling $1.2 million are included in the company's expansion program for the year. Of this amount $320,697 is for 151 autos and trucks and $19,000 is for 10 trailers. A total of $238,587 is to be spent for general tools, including 11 welders, one crane, nine back hoes, 17 air compressors and two ditchers. Additional expenditures will be made for garage equipment, tools, and for radio equipment.

Radio systems

The Ohio Fuel Gas Co. has two complete radio systems. One of these operates statewide for transmission and production while the other serves the company's distribution system. In the transmission and production systems there are 24 base stations and 140 mobile units in cars and trucks. This year the company installed a new station at the Mt. Vernon, Ohio, pipeline headquarters; added a remote control unit at Medina, and added five mobile units.

In the company's distribution radio system seven mobile units were added; four in the Columbus district and three in the Elyria district. Five of Dhio Fuel's eight distribution districts are now radio equipped. There are a total of 95 cars equipped with two-way radio throughout the distribution districts in the state.

Rugged hill country in Ohio Fuel's new Guernsey underground storage field. Line leads from Texas Eastern tie-in.

Stringing along route of the line for Guernsey storage project. Field will have a capacity of 4.7 billion cu ft.

Part 4

Manufacturers, key unit in Pittsburgh, spends $9 million

GAS staff report

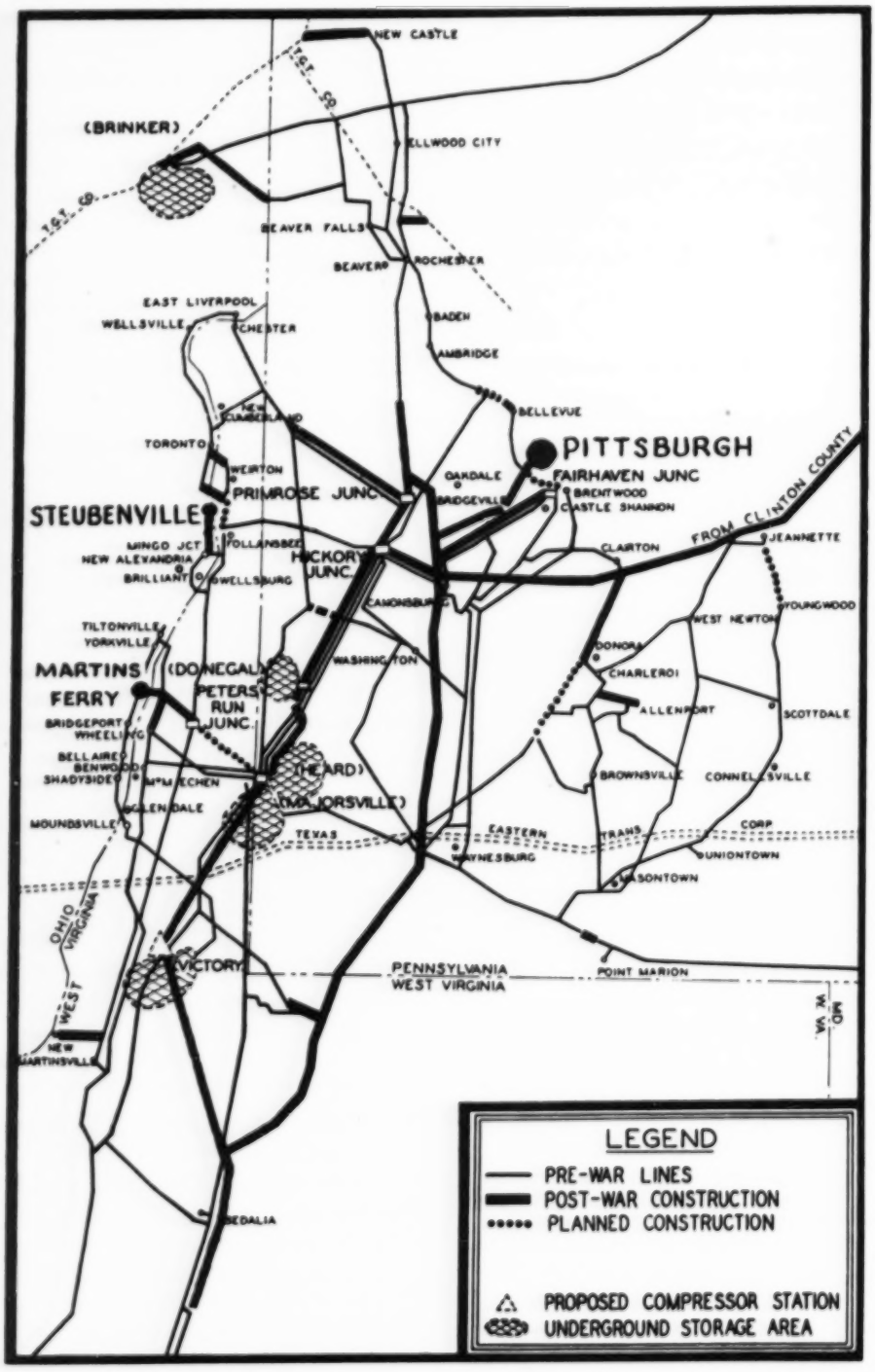


Fig. 1. Manufacturers' 425-mile central delivery system has been expanded by the addition of 100 miles of line and storage facilities costing $9 million.

THE Manufacturers Light & Heat Co., key unit in the Pittsburgh Group of the Columbia Gas System companies, has this summer put the finishing touches on a widespread expansion of its tri-state, "central delivery" system in preparation for additional supplies of gas which will be available this fall. More than 100 miles of new line was built, a new underground storage field was developed, and existing storage fields were expanded in a program that required an outlay of approximately $9 million.

Expansion of this kind, undertaken by all members of the Pittsburgh Group companies, including Manufacturers, actually got underway several years ago in anticipation of the new supplies of natural gas. Expenditures by all members of the group have amounted to over $100 million since 1951, including $34 million budgeted for 1954, or a total of over $150 million in the postwar period.

Other members of the group, in addition to Manufacturers, include Cumberland & Allegheny Gas Co., Natural Gas Co. of West Virginia, The Keystone Gas Co., Binghamton Gas Works, and Home Gas Co.

Key link in Manufacturers' 325-mile "central delivery" system *(Fig. 1)* will be forged when 68 miles of line is laid from Doddridge county in northwestern West Virginia to Donegal compressor station in western Pennsylvania. At Donegal the line will be linked with 14 miles of 26-in. line built last year from Donegal to Hickory pressure control station to make an 82-mile artery into the heart of Manufacturers' distribution area. The new 68-mile section was built at an estimated cost of $4.2 million.

Southern end of the new line connects to the United Fuel Gas Co. line from United's Glenville compressor station, to result in looped 16-in. and 20-in. lines the entire 46 miles between

Glenville station and Manufacturers' Carnegie, W. Va., station. Capacity of the line will be increased from 105 MMcf per day to 178 MMcf per day.

From Carnegie station the line branches off through the company's newly developed Victory storage field located about midway between Carnegie and Donegal stations in the northwestern tip of West Virginia.

Victory storage underlies an area of 35,159 acres and has an estimated capacity of 34,500 MMcf of gas. The gas is stored at about the 2000-ft level at about 800 psig. Victory compressor station includes two 880-hp Clark engines for a total of 1760 hp. The storage facility, including two measuring stations, main field line and well line, involved an expenditure of nearly $2 million.

This 82-mile artery will be the newest of three principal postwar pipelines that have been put into use by the company. The others include a 79-mile "underground expressway" moving southwest gas north through Waynesburg, Pa., to the vicinity of Pittsburgh, and a 167-mile "turnpike" from the northern Pennsylvania gas fields.

Feeders

The 325-mile central system is fed at the northern, central and southern sections by southwest gas. The central feed is gas from the Texas Eastern lines and the southern section is fed from United Fuel Gas Co., which is already taking from Tennessee Gas Transmission Co. and will get substantially additional supplies from the new Gulf Interstate line. The northern feed, receiving gas supplied from the mainline of TGT, will be made stronger this year by the investment of $1.2 million to expand the company's Brinker storage field and the building of over 13 miles of new line through New Waterford, Ohio, to the Pennsylvania state line.

This investment will better deliveries to Natural Gas Co. customers as well as Manufacturers' Beaver Valley industrial and residential users.

Leading gas from the major arteries of the central network are "market lines" now built or to be built. Among those scheduled for completion this year are a 14-mile line tapping the 79-mile Waynesboro artery which will step up gas deliveries to the South Hills section of Pittsburgh, eight miles of 16-in. to move gas north from Primrose station on the 82-mile main supply leg and two spurs, totalling 15 miles of line, with a 14-mile line built last year which will take gas into West Virginia and Ohio.

Six river crossings laid since 1945, at New Martinsville, Glen Dale, Martins Ferry, Brilliant, Steubenville, and Weirton, will play an important role in getting gas to the company's Ohio customers. Other "market line" expansion includes a tap from Heard station on the 82-mile artery to Peters Run station moving gas into the Wheeling area and a short but vital four-mile stretch running from the supply network toward Wellsburg.

Connection

An important market line laid last year from Primrose to Frankfort Springs in western Washington county, Pa., will be connected this year with the new 68-mile leg of the main supply network to move gas into the Weirton-Chester, W. Va., area.

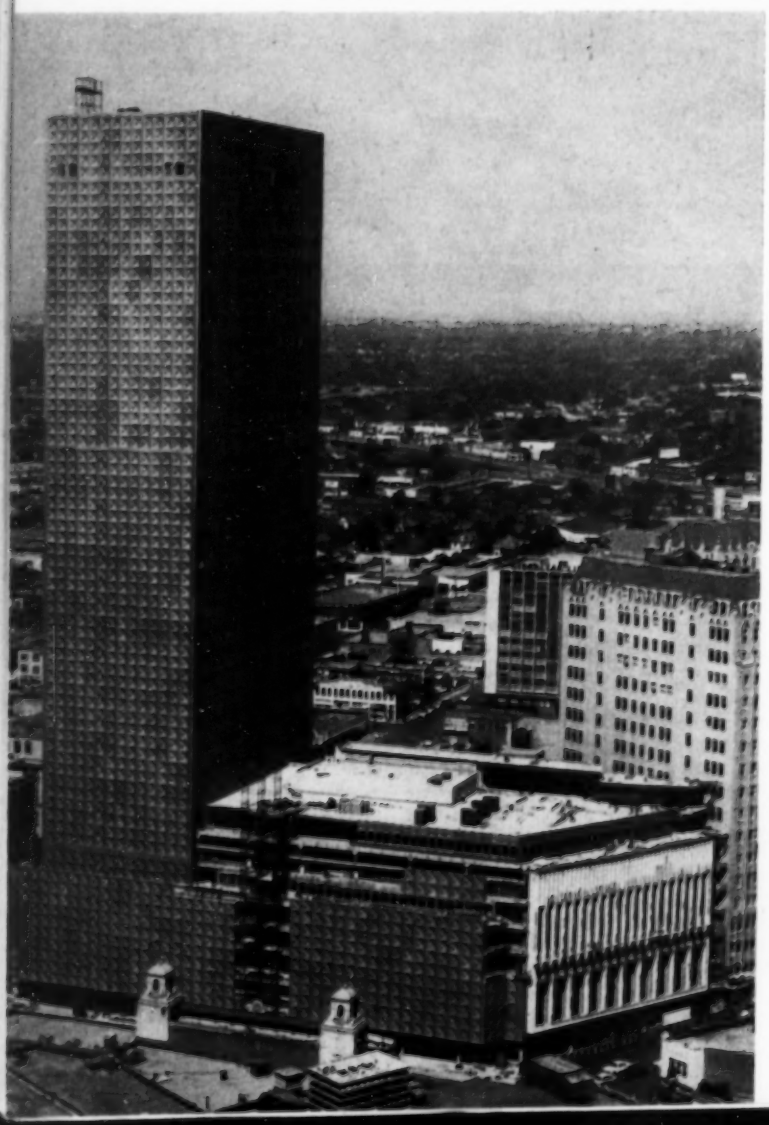
When Home Gas Co., another of the Pittsburgh Group companies, completes a $1,724,500, 50-mile line in the vicinity of Binghamton and Corning, N. Y., Binghamton Gas Works and Keystone Gas Co. *(Fig. 2)* customers will be tapping a total postwar investment of some $19 million.

The new section of line will not only give the two New York companies a "master delivery" system akin to the tri-state's "central delivery" system, but it will also reinforce the circular supply pattern which embraces the entire Pittsburgh Group service area. As one result of this expansion, Olean, once merely a way-station on the company's mainline into Binghamton area, will now have unlimited supplies of gas. Olean, which could in the past tap only 30% of the gas passing through its area, leaving 70% for New York towns farther east, will now have 100% of the western line's capacity available to its customers.

Fig. 2. Home Gas Co. is completing a 50-mile line that will give the company a "master delivery" system for southern New York state.

● ***These tremendous bursts of construction energy are made possible—and necessitated—chiefly by the huge new Gulf Interstate line, largest new carrier to go into operation in 1954. For a comprehensive treatment of the Gulf project, see the Pipeline Section.***

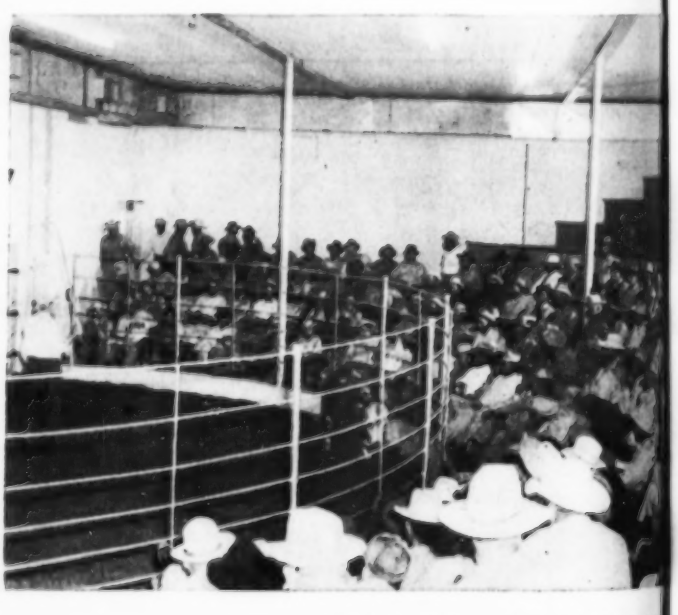
LONE STAR HAS THE BIG AIR CONDITIONING JOBS ON GAS



1 **Exterior** of Rockwell Manufacturing Co.'s new plant at Sulphur Springs, Texas (above). The plant's system is a combination heating and cooling system.

2 **Dallas' tallest building** (left) and one of the largest buildings in the Southwest is the Republic National Bank, which will have a gas-fired air conditioning system.

3 **The Temple** livestock auction barn (below), believed to be the world's only air conditioned cattle barn, is cooled by a 35-ton Ready-Power unit installed by Lone Star in August 1950.



GAS exclusive

Texas marks the trail toward a boom in all-year air conditioning with gas

By MERLE CUNNINGHAM

THE answer to the gas industry's sixty-four dollar question, "How can we sell as much gas in summer as in winter," has not been found.

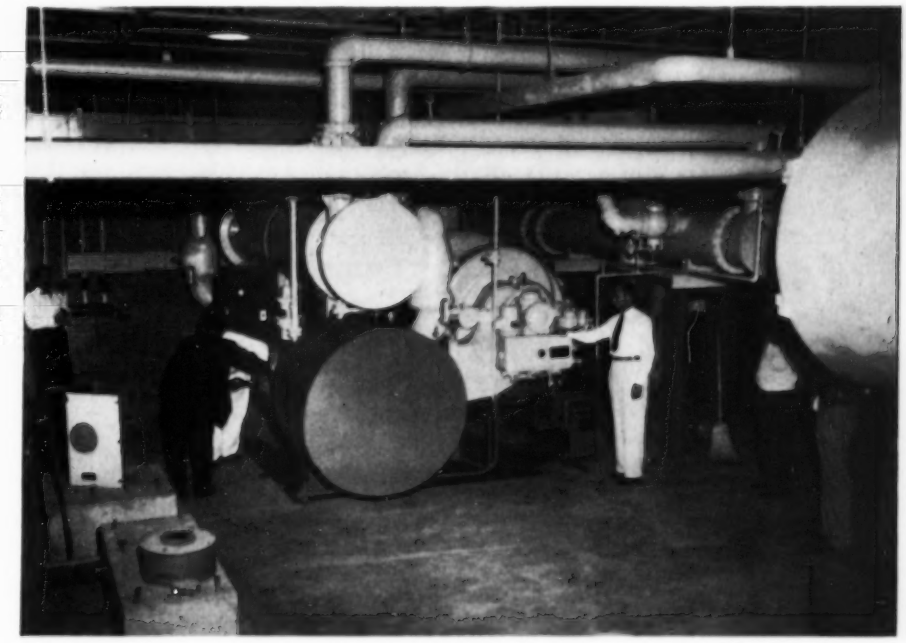
But at least a partial answer may lie in the industry's current reach for the "hot" air conditioning market. Companies like Lone Star Gas Co., serving more than 690,000 customers in 424 cities and towns in Texas and Oklahoma, are getting on the air conditioning band wagon, being aware of such predictions as that of the American Institute of Management: In 10 years, year-round air conditioning will be standard equipment in all new homes and non-air conditioned houses will be virtually obsolete.

The Southwest, with its summer temperatures of near 100° and over almost daily and mild weather more than six months out of the year, was a ready market for air conditioning and was the first section of the nation to go in for residential air conditioning.

Early air conditioning was industrial, and the residential market did not open up until after World War II. Lone Star Gas, with headquarters in Dallas, has been promoting gas air conditioning for both homes and businesses since 1947. Specialty salesmen and air conditioning engineers were employed over the company's Texas system, and a little more than a year ago the company created the job of air conditioning sales coordinator and stepped up its strong air conditioning advertising program.

Since the war, company officials have played an important role in helping bring new industries to territories served by Lone Star, then selling those industries on year-round gas air conditioning.

Chester L. May, Lone Star senior vice president in charge of distribution properties, was honored last year by the east Texas town of Sulphur Springs for his efforts in helping locate a Rockwell Manufacturing Co. plant there. The 126,000-sq-ft valve manufacturing plant is completely air conditioned with a centrifugal machine driven by a steam turbine. The steam is generated by gas for both heating and cooling.



Rockwell's plant at Sulphur Springs has two 130-hp gas-fired boilers, which provide necessary steam to drive a turbine, which, in turn, drives a centrifugal compressor that cools water for the daily requirement of 450 tons of refrigeration.

Lone Star's air conditioning program is centered around air conditioning specialists. W. A. Collins Jr., air conditioning sales coordinator, specialized in air conditioning at Texas A&M College, where he was graduated in mechanical engineering. Air conditioning sales and installation personnel are also trained on the job and at manufacturers' schools.

Mr. Collins acts as liaison between Servel, the company's sales department, and management in promoting air conditioning sales within Lone Star's general division and Dallas and Fort Worth divisions.

Company salesmen and industrial engineers, with the aid of newspaper and magazine ads prepared by the company advertising department, work to put Servel absorption units in Texas homes and small businesses, at the same time contacting consulting engineers, architects, owners and builders on larger installations, trying to sell them on one of several types of gas-fired air conditioning installations.

At the present time there are more than 2500 Servel absorption units on Lone Star lines, a third of which are

in commercial establishments and two-thirds in residences, and gas from Lone Star lines is utilized in air conditioning systems in hundreds of other businesses and industries.

That the electric industry has made inroads on gas cooking throughout the country is a well known fact, but to Lone Star turnabout is fair play, and the gas company not only is offsetting some of this competition by increasing its load with air conditioning, but may be giving the electric companies something to be concerned about. Five large buildings under construction in Dallas at the present time will be air conditioned by gas-fired installations, adding 7200 tons to company lines and bringing Lone Star's total air conditioning tonnage in Dallas to 20,495. Total tonnage of all air conditioning on Lone Star lines presently is 43,077, which does not include the additional 7200 tons now in process of installation. This year, according to Coordinator Collins, the company expects to add 20% more units to its lines over last year's business.

Competitive situation

Gas companies competing with electric powered air conditioning are advised by Mr. Collins to study the competitive fuel in their area.

"Compare owning and operating cost of various types of equipment; arm yourself with facts and go to prospective owners, architects and consulting engineers and tell them the gas story," he says.

It is extremely important to give assistance to consulting engineers, he believes.

Effective and low cost operation of natural gas as a fuel for air conditioning as well as heating is selling many industries on gas.

Lone Star engineers, installs, and services Servel and Ready-Power units and promotes installation of Carrier steam absorption systems and steam turbine-driven centrifugal compressors. The Servel and Carrier systems use water as a refrigerant and lithium bromide as an absorbent.

These indirect-fired systems seem to be the best method of utilizing gas for cooling purposes on anything approaching volume basis, according to Mr. Collins.

"The indirect-fired system is advantageous to those utilities that must curtail gas service during winter months, as the customer may use oil or coal then and change to gas in the summer for cooling purposes when it is in better supply," he said.

Servel has 2-, 3-, 5-, and 25-ton units in production, all of which are handled by Lone Star. The 2-, 3-, and 5-ton units are applicable for residences and small commercial buildings. The 25-ton unit is a water chiller and is popular where a moderate amount of cooling is needed, such as large residences, churches, printing plants, laboratories, textile mills, and anodizing plants.

The Carrier absorption machine also is a water chiller unit. There are two types of machines. The open machines vary in seven sizes from 110 to 675 tons of capacity for single units at 45° F refrigerant temperature and may be operated as low as 36° F. There are three internal or closed type machines in tonnages from 96 to 170 tons. This equipment is relatively compact and has advantage of the absorption cycle in that efficiency is substantially unchanged.

The Carrier absorption machine is particularly suited to large buildings and is advantageous to factory or department store or office building which has a steam plant lying idle in summer. The unit will operate on either high or low pressure steam, or even with low pressure waste steam. Aside from air distribution fans and a small solution pump, it has no moving parts and therefore is practically noiseless and vibrationless. The unit is of light weight, and Employers Casualty building in Dallas has three Carrier units, of 450 total tonnage, installed on the roof to save space inside the building.

For large industrial requirements, Lone Star recommends centrifugal compressors with steam turbine drive, of which Carrier, York and Worthington are the major manufacturers. This equipment is available in about eight sizes ranging from about 150 to 1100 tons, and in the case where a compressor is driven from each end of the shaft of a steam turbine, a total capacity of 2200 tons may be obtained from one basic machine. Temperature ranges are from —120° F to 60° F. The operating characteristics of the centrifugal compressor are much the same as a steam turbine which permits a direct connection. The combination of a centrifugal compressor and turbine drive is of great value to all industries requiring both refrigeration and process steam. In such plants the use provides an ideal heat balance. The steam turbine also provides year-round use of boilers, thereby eliminating a non-working investment during the warm season.

Another indirect-fired system, gas engines driving reciprocating compressors, is handled by Lone Star in the Ready-Power units—15- to 70-ton engined refrigeration units in which an International Harvester engine drives a radial compressor, directly connected. The equipment uses Freon-12 or Freon-22. The company started selling them in 1949 and now has about 90 Ready-Power units of 3000 tons on its system. They are particularly suited to 25- to 150-ton installations in theaters, apartment hotels, and office buildings.

An unusual application of this equipment is at Temple, Texas, where in August 1950 a 35-ton Ready-Power unit was installed by Lone Star in the Temple Livestock Auction Barn, believed to be the world's only air conditioned cattle auction barn.

George Cruce, office manager of the auction barn, says, "It is really a pleasure to work in such a cool and comfortable place, and we have large crowds at nearly all of our sales with many comments about the pleasant air conditioning."

Lone Star is finding Servel's new direct-fired two-ton unit popular for small homes and for small commercial uses such as in barber shops and offices. This unit was developed recently for small applications.

Service contract

A service contract is made available by Lone Star to gas air conditioning purchasers. This contract offers to furnish service under two options. Under the first option, for $36 a year, filters will be changed twice and the units will receive a thorough inspection, lubrication and maintenance service during the fall and spring startups, at which time the cooling tower is drained or filled respectively. The contract provides for an additional call of no charge during the year. There is no charge, of course, for lighting and adjusting burners or pilots. Under option 2, the customer may elect to have the equipment serviced on a time and material basis.

Lone Star engineers stress the fact that planning for air conditioning in the initial stages permits much less expensive installations than if air conditioning is added after the building is constructed. Rockwell's modern manu-

. . . DOMESTIC JOBS, TOO

Under construction at Arlington, Texas, is this moderately priced Servel air conditioned home (above).

At the Consolidated Vultee Aircraft Corp. plant at Fort Worth (below), 3.5 sq ft of space is cooled by 12,105 tons of air conditioning installed in 12 Worthington steam-driven centrifugal compressors.

Open Sunday, April 11
8 Servel Gas Air Conditioned
3 and 4 Bedroom Brick Homes
$12,350 to $13,500
Arlington's Pennie Court
1 block south of West Abram
New concept of design gives you more for your money!
DURING THE LONGEST, HOTTEST HEAT WAVE your whole family will benefit from Servel's cool, healthful, invigorating climate. They will breathe filter-cleaned fresh air. Every night they will enjoy sound, restful sleep without wilting, sticky humidity. House cleaning will be reduced. Compactness, step-saving floor plan and provision for every work-saving appliance make these homes ideal for families with children.
Servel's exclusive gas-operated motorless refrigeration unit assures low-cost operation . . . plus repair-free, worry-free ownership. Thanks to the new concept of designing a home around air conditioning, many costly features in ordinary homes were eliminated. The resulting construction savings will be enjoyed by you.
If you've waited for a better buy, go see these homes with Servel, the standard of quality in air conditioning.
• 75 front foot lots
• Concrete walks and driveway
• Concrete paved streets
• One knotty pine panelled bedroom or den
• Tile bath and shower
• Eating area in kitchen
• Double sink with garbage disposal
• Washing machine connections
• 30 gallon water heater
• Central radio
• Attic and wall insulation
• Screened rear porch
• Garage walls finished
• Freezer and utility space in garage
• Aluminum screens
• Double slab doors
• Lifetime guarantee hardware
• Venetian blinds
Only Servel Gas Air Conditioners Give You All These Advantages
Built and For Sale by Irless Jordan, Developer—AR-5-2842
LONE STAR GAS COMPANY

This ad, boosting Servel air conditioned homes, was used in Lone Star's campaign promoting the home pictured at left.

facturing plant at Sulphur Springs, completed in 1953, was designed from the start with the idea of installing air conditioning. Many factors were taken into consideration in order to make the installation of cooling equipment compatible with the function of the building. Glass area was held to a minimum; insulation was applied where needed, and provisions were made for placing exhaust hoods over equipment which produces an unusual amount of heat. The plant has a crane running down the middle for virtually its entire length. This would have complicated the installation of piping in an existing building; however, in the early planning, provisions were easily made for circulating water piping to go underground or be otherwise routed to prevent interference with the production lines.

The Rockwell plant, manufacturing valve body assemblies, is air conditioned with a 425-ton Worthington centrifugal refrigeration machine driven by a steam turbine. The production area, as well as the office space, is air conditioned throughout. This particular refrigeration system chills water to 45°, and the cold water is then circulated through ducts into the various areas of the building. There are about 23 of these units.

Consolidated Vultee Aircraft Corp. at Fort Worth, the world's largest integrated aircraft plant, and Alford Refrigerated Warehouse in Dallas, the largest refrigerated warehouse in the country, are other Lone Star customers.

Convair is one of the largest air conditioned plants in the nation. To cool the administration building, assembly plant, hangar, experimental building, and cafeteria—a total of 3½ million

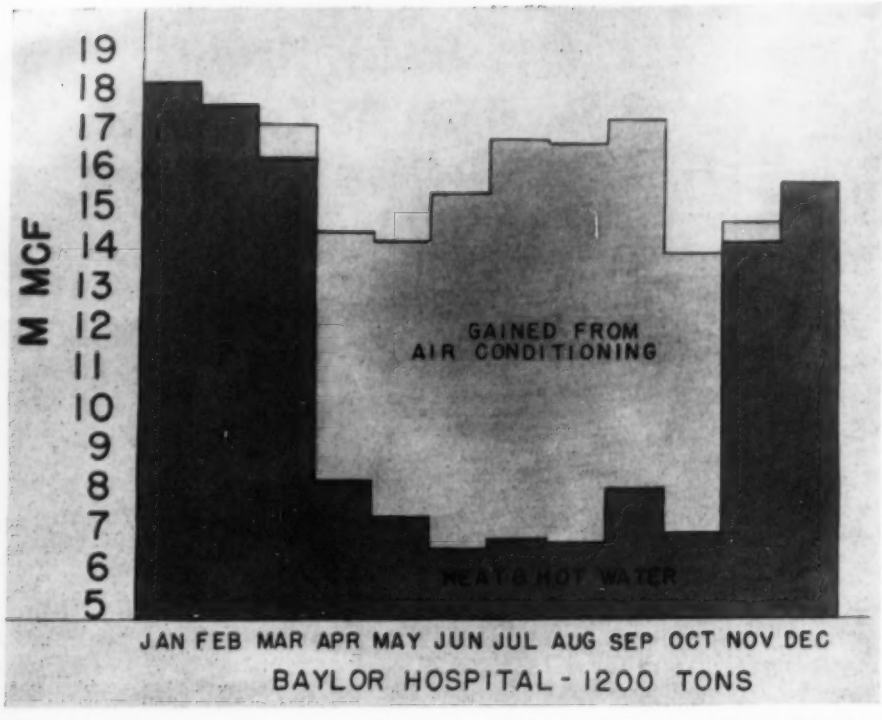


Chart shows load increase at Baylor hospital in Dallas with gas-fired air conditioning.

sq ft of space—12,105 tons of air conditioning are installed in 12 Worthington steam-driven centrifugal compressors. The output is equal to 24,210,000 lb of ice melting daily.

Alford, with 7.5 million cu ft of space, requires 1000 tons of refrigeration, which is operated by gas engines.

The 2.5 million cu ft of air will be cooled by five steam-driven York centrifugal compressors at the new General Motors assembly plant in Arlington, between Dallas and Fort Worth. The plant was completed last fall and officially dedicated in June of this year.

Dallas' tallest building, the Republic National Bank, is one of those buildings under construction that will be air conditioned by a system utilizing natural gas. Scheduled to be completed the end of this year, the building, with 36 stories aboveground and four below, will be cooled by two 1000-ton steam turbine-driven centrifugal refrigeration machines. Two Babcock & Wilcox gas-fired water-tube boilers will produce steam to drive the turbines operating the refrigeration machines. In the winter, the boilers will provide hot water for heating.

Dallas' newest hotel, the Statler, scheduled for completion in 1955, will have 1800 tons of air conditioning in which centrifugal compressors will be driven by gas-fired steam turbines. Other buildings under construction that have chosen gas air conditioning are Dallas City-County Hospital, with one 80-ton and one 277-ton Worthington steam-driven centrifugal compressors, a Southern Methodist University building, part of the school's current expansion program, with an additional 1000-ton steam turbine-driven centrifugal compressor, and the Southwestern Medical School basic science building, which will have a gas-fired steam turbine-driven centrifugal machine to produce 1000 tons of refrigeration.

To what extent does gas air conditioning for large applications such as these increase the load on gas company lines? An example given by Lone Star is the 1200-ton turbine-driven centrifugal compressor system installed in Baylor Hospital in Dallas. The load for heating and hot water usage varied from about 18.5 MMcf in January to 6.8 MMcf in June, with an annual load factor of about 61%. The additional load imposed by the air conditioning system uses gas to the extent that the high and low months are now 18.5 MMcf and 14.3 MMcf respectively, or a load factor of 89%, an increase of 28 percentage points.

Lone Star reaches the residential market with a well-rounded advertising and sales promotion program, sometimes carried on cooperatively with Servel. Recently the gas company joined a real estate developer in promoting Servel "All-Year" gas air conditioned homes, located at Arlington.

At the open house, which initiated the public showing of the new houses, Lone Star home economists and salesmen were on hand, not only to explain the gas air conditioning system, but other features of the homes too, thus helping the developer, Irless Jordon.

A tour of the well-constructed three- and four-bedroom homes, priced at $12,500 to $13,500, brought a realization to many that modest income families can afford air conditioning. Other features of the homes, mentioned by Lone Star in its ads to indicate the quality of construction and design, were concrete walks and sidewalks, one knotty pine paneled bedroom or den, double sink with garbage disposal, 30-gal. water heater, freezer and utility space in garage, and washing machine connections.

With three of the eight homes sold a few weeks after the opening, the builder was planning to construct several more.

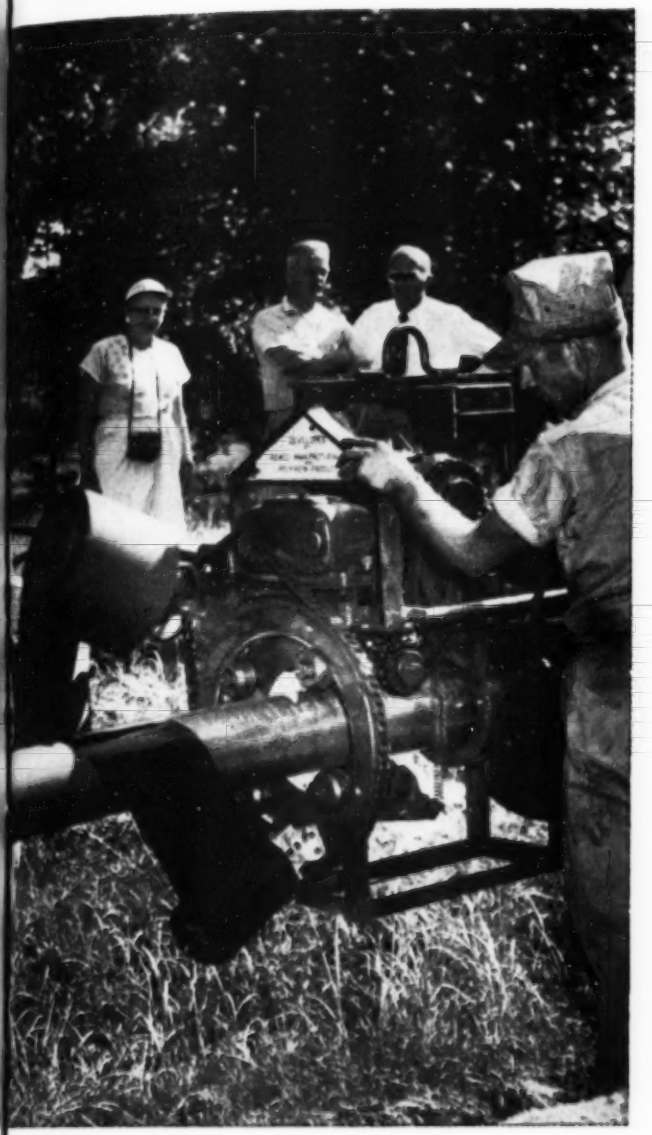
Another good story the company has been telling recently in its advertising is the experience of a Dallas couple who replaced electrically operated compressor-type air conditioners with Servel All-Year gas air conditioners in an apartment building. The apartment owners have written the gas company that in the first year's operation gas air conditioning cut operating and maintenance costs per ton in half—and as a result, the apartment owners are placing 16 Servel units in two newly acquired apartment buildings.

Buying its own sales talk, Lone Star has air conditioned the majority of its office buildings throughout the system. At the home office in Dallas, the cooling system is turned on when the mercury hits 50°. Thus, the system is used some days out of each month in the year. All four buildings at the Dallas headquarters are air conditioned. The two main buildings, 10 and 11 stories high, are cooled by four Carrier absorption machines of 160 tons each. A third building is cooled by three Servel DUT water chillers of 75 tons capacity, and the fourth building is cooled by a 60-ton Ready-Power unit.

To help make it possible for Lone Star employees to enjoy air conditioning at home as well as at the office, the company in April this year announced special terms under which employees may more conveniently purchase Servel air conditioning equipment.

GAS exclusive

New city gas system in Georgia given complete tape wrap



Remco power-driven taping equipment in action. Roll of Polyken tape is seen in wrapping process, followed by roll of felt covering used to protect tape from any exterior damage.

Holiday detector is run over wrapped pipe behind machine to detect any openings or spots not completely coated. Length of assembled pipe in front shows that there are no joints that would require special taping.

CHARACTERISTIC of the flourishing extension of natural gas distribution into the municipalities of the Southeast, the city of Waynesboro, Ga., is investing $257,823 in a new municipal gas system comprising more than 30 miles of transmission and distribution pipe—the nation's first to be entirely coated by plastic tape for the control of surface corrosion.

Speedy machine

Coupled with this first complete use of a plastic tape coating on an entire gas pipe system is the first use of high-speed power-driven cleaning and wrapping equipment. The machine cleans the pipe, wraps it, presses the tape firmly to the surface, and over-wraps the tape coating with tar-saturated asbestos felt at top speeds approaching 30,000 ft a day. Coupled with the protective performance of this coating and gradually lowering costs of polyethylene, the machine operation greatly increases the economic utility of plastic tapes as corrosion barriers in pipeline work.

Following a thorough analysis of the capabilities and economics of plastic tape for pipeline corrosion control, Polyken No. 900, a polyethylene plastic adhesive tape manufactured specifically for corrosion control by the Polyken Products, Department of the Kendall Co., Chicago, was specified as the cor-

rosion barrier, with an overwrap of tar saturated felt.

The power taping equipment was designed and built by Remco Manufacturing Co. of Tulsa, aided by Polyken engineers, and utilizes a wrapping arm designed for the job by Bauer & Black. Special construction features enable it to be put on and removed from the pipeline in a few moments. The unit is self-propelled, forward travel being synchronized with the wrapping head by a Linkbelt P.I.V. unit. No change of sprockets is required when changing from one width of tape to another. Capable of wrapping pipes up to 6 in. in diameter, the machine used on the Waynesboro job can apply tape in widths of 2, 3, 4, 6, and 9 in. One man on the machine, with the aid of a boom crane and operator, can wrap more tape than 12 or 15 skilled men normally wrap manually in the same time.

Former methods

In the past, pipe coating materials have been applied in liquid or molten form. In a sense the protective film has been manufactured in the field. In contrast, plastic tapes are pre-formed into a continuous film impervious to moisture and normal corrosive environments, are completely controlled in composition and properties by their manufacturing processes, and are independent of most of the troublesome variables which occur in the field manufacture of the coating film. Such plastic adhesive tapes are cold applied as contrasted with the hot melt application of historically used materials.

This entire installation was designed and engineered by the John J. Harte Co. of Atlanta. Background experience and engineering consultation leading to the specification of the material and method, as well as field service on the tape application, were provided by Anti-Corrosion Manufacturing Co., Atlanta, Polyken's enfranchised tape-coating specialists in that area of the country.

H. A. DeMeza, Harte's on-the-job engineering supervisor, explains the choice of plastic coating this way:

Reasons for choice

1. Applied just prior to lowering into the ditch, over-the-ditch tape coating eliminates all pre-lowering coating damage and need for repair.

2. Although the tape is presently more expensive per square foot than the conventional hot-melt coatings, its application is so simple that substantial savings are made in labor costs.

3. Because the Polyken coating is manufactured in a continuously controlled operation, its thickness and composition is consistently accurate. The contractor is relieved of many quality control problems.

4. Polyethylene plastic ranks high among film forming materials as a moisture and galvanic barrier under normal temperature conditions and can be adequately protected against mechanical damage to preserve this character.

5. Polyken's simplicity of application means that any future addition to the system can be easily and effectively handled by a city maintenance crew without the services of an outside contractor.

The R. & C. Construction Co., Winder, Ga., began installing this system on July 23, and by its completion in September, had wrapped some 218,000 sq ft of tape on the 30 miles of transmission, distribution and service lines. The Remco power equipment is being used to wrap approximately 28 miles of 3-in. to 6-in. pipe, while the remaining several miles of ¾-in. to 1½-in. service pipe is being taped with manually operated machines.

On the basis of his initial experience on the taping, felt over-wrapping and laying of about three miles of 4-in. pipe, the contractor has reported an application cost of less than 2 cents per foot. This includes cleaning cost inasmuch as the Remco machine used in this installation was equipped with a cleaning head and felt head in addition to the tape head, combining these three principal operations. It was found that on straight-run pipe this complete wrapping job could be done at a rate of about five miles a day.

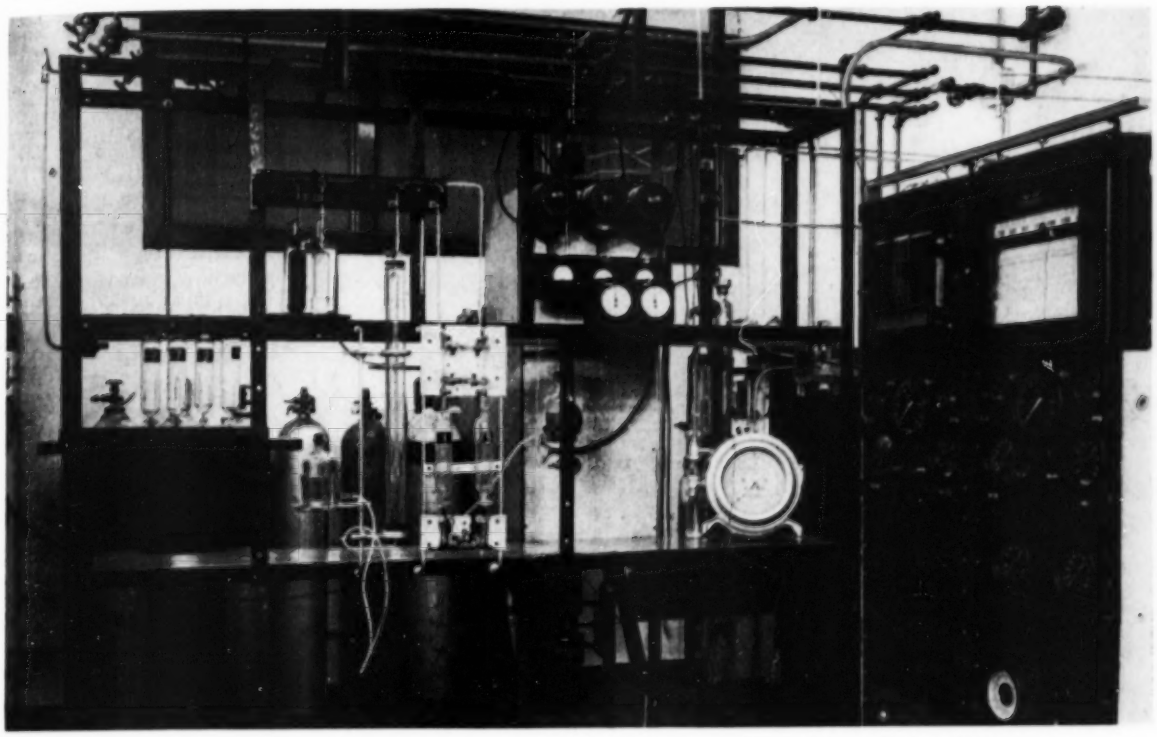
Further protection

The Waynesboro system, which is ultimately to be further protected by a cathodic protection system, is receiving much attention from corrosion engineers and other engineering, contracting and management people associated with the gas and pipeline industry. It's considered to be a significant advance in the continuing battle being waged in behalf of pipeline preservation and maintenance.

Steel brushes clean the pipe prior to application of tape and felt.

Another view of the automatic cleaning and wrapping machine.

GAS ENGINEERING SCHOOLS: PART 2 IN A SERIES



Pilot unit for studying catalysts for the synthesis of hydrocarbons at the University of Michigan.

Research under state association sponsorship marks gas engineering program at Michigan

GAS engineering has been emphasized by members of the Chemical Engineering faculty at the University of Michigan for more than 50 years. Students working towards degrees in chemical engineering have taken courses and conducted research to qualify themselves for positions in the field of manufactured gas and more recently in natural gas production and distribution.

Centennial of engineering

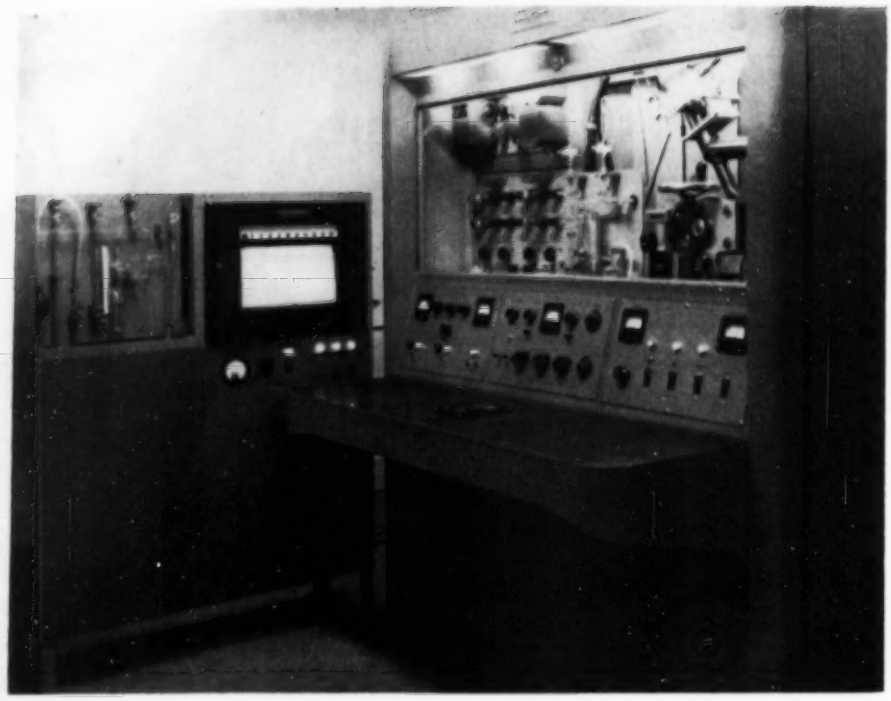
The university, organized in 1817 while Michigan was still a territory, celebrated its Centennial of Engineering Education by a convocation last October. Many distinguished alumni were cited, several of whom were from the gas industry. Chemical engineering started at Michigan in 1898, the second in the land, with the appointment of the late Alfred H. White as instructor in chemical technology. Just two years later, in 1900, the first Industrial Fellowship was initiated at the university by the Michigan Gas Association. For some 40 years this fellowship supported students in graduate study and research in the field of gas engineering under the guidance of the late Professor White. Since 1943, Dr. Robert R. White, professor of chemical engineering, has been the faculty sponsor.

During the past 10 years, the research under the Michigan Gas Association program has consisted of a highly integrated series of investigations on the rates of the reactions between carbon monoxide, carbon dioxide and hydrogen to produce methane and other hydrocarbons. The kinetic studies of nickel and iron catalysts have been coordinated with investigations of activated absorption and electron diffractions of catalyst surfaces. A double-beam infrared spectrometer was installed to assist in analyzing gaseous products of the various reactions. At the present time the program is investigating the economics of high Btu gas production, the use of fluidized iron catalyst and the effects of extreme pressure (25,000 psi) on the reactions.

Practical and fundamental

The catalytic studies of methane production have been on a fundamental as well as a practical basis so that most of the research has led to doctoral dissertations and lends itself to the illustration of basic engineering principles in the graduate and undergraduate classes.

GAS exclusive



Mass spectrometer for gas analyses will facilitate research in the behavior of natural gas and of gaseous reactions.

Special courses in the field of gas engineering have been given in line with the trend of the times. In the period of 1910-1935, courses in manufactured gas engineering were given by the late Prof. A. H. White and Prof. E. S. Pettyjohn, now director of the Institute of Gas Technology in Chicago.

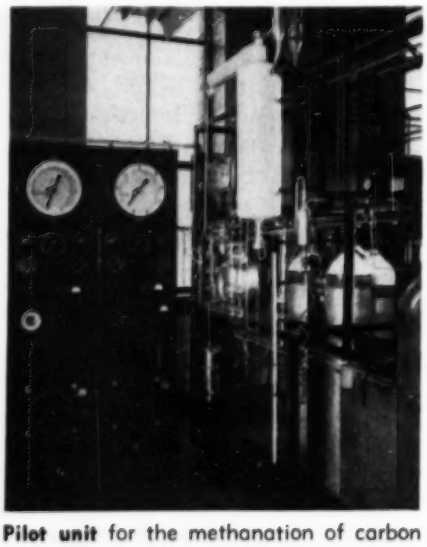
More recently, natural gas has received considerable attention. A course on petroleum production engineering has emphasized the properties of natural gas, estimation of gas reserves, and flow of gas through porous media. Natural gas hydrates have been investigated, and a method of predicting hydrate formation conditions was developed by the class just mentioned. Advanced students under Dr. G. G. Brown, now dean of engineering at the university, prepared enthalpy-entropy diagrams for natural gases. The compressibility factor chart adopted by the Natural Gasoline Association of America as a standard for metering of natural gases was prepared at the university. Recent researches involving natural gas were on the phase behavior of the methane-carbon dioxide system at low temperatures and the unsteady-state flow of natural gas from reservoirs.

Research in the behavior of natural gas and of gaseous reactions will be facilitated by the use of a new mass spectrometer being installed for gas analyses. Gas engineering will continue at the university as an important area of concentration by a group on the faculty. Such emphasis has attracted students in the past and is likely to continue over the years ahead.

Next month

University of Pennsylvania, with sidelights on studies available at the Institute of Gas Technology.

The first part of this series, which appeared in September, was devoted to the University of Houston and Columbia University.



Pilot unit for the methanation of carbon monoxide, carbon dioxide, and hydrogen.

Purdue conducts varied research studies

ALTHOUGH Purdue University at Lafayette, Ind., does not have a department or division devoted to gas engineering, it does conduct some interesting research projects in cooperation with the Indiana Gas Association and the American Gas Association. The university also has a large number of men employed in the gas industry, and has had for many years.

In 1927, the Indiana Gas Association started its cooperative effort with Purdue University with a five-year grant of $50,000 and the appointment of Prof. R. D. Leckie to carry on the work. He was engaged in research work for the gas industry, and also to head up a gas option in chemical engineering. During his tenure, Professor Leckie trained many competent engineers for the gas industry, as well as contributing many fine pieces of research on domestic heaters, gas water heaters, service materials, etc. His chief contribution was undoubtedly the development of the conversion gas burner, as it exists today.

The gas option was dropped about 15 years ago along with all other specialized ones in the school. The research work for the Indiana Gas Association has continued and is still active at present.

Some of the more important problems that have been investigated during the course of this research program's 27 years include gas-fired house heating equipment, development of a direct contact water heater, the use of gaseous fuel in warm-air furnaces, scale formation in water heaters, hydrogenation of coal to produce high Btu gas, home humidity control, underground leak detection by sonic means, ultrasonic testing of welds, control of mixed industrial gases, electric ignition for gas appliances.

At the present time, two research programs are active at Purdue. One for the various projects of the Indiana association and the other on venting of gas-fired appliances for the AGA. These projects are manned by undergraduate and graduate students under the direction of Prof. Sam C. Hite.

INGAA resolution calls for Congressional action in wake of Phillips decision

THE far-reaching implications of the recent U. S. Supreme Court decision in the Phillips Petroleum Co. case were discussed at considerable lengtth and in some fair amount of detail at the September annual meeting of the Independent Natural Gas Association of America in New Orleans. The effect the decision has had upon the industry and the course to be taken in future actions were taken under careful study by management representatives attending the meeting.

The Phillips decision has been interpreted by the Federal Power Commission, in its Order 174-A, as subjecting to the Natural Gas Act all producers of natural gas who transport or sell natural gas in interstate commerce. The order requires that all independent producers selling gas in interstate commerce must, by Oct. 1, file for an FPC certificate. It also requires that there be no abandonment of facilities or services or change in rates from that in force and in use on June 7, the date of the Phillips decision.

Major formal discussions of the court decision and the resultant FPC order revolved around a talk by Commissioner S. L. Digby, of the Federal Power Commission, and a question-and-answer session with William S. Tarver on the questioning side and Willard W. Gatchell, general counsel of the FPC, on the answering side. The subject was also discussed by Association President C. P. Rather in his annual report.

FPC opposed decision

It was emphasized by numerous speakers throughout the two-day meeting that the industry should recognize the fact that FPC did not seek the jurisdiction that was thrust upon it by the Supreme Court. President C .P. Rather, in his annual report to the association, pointed out that FPC had decided that Phillips was not a natural gas company.

"In his comments before the Practicing Law Institute in New York City on June 7, the date of the Phillips decision, Commissioner Smith," according to Mr. Rather, "pointed out that the commission has uniformly taken the position that the independent producer or gatherer of natural gas was not subjected to the Natural Gas Act and that it was not the intention of the Congress that it should be." Therefore, he continued, the commission should not be blamed for the decision nor criticized for carrying out the oath of office in attempting to perform its duties under the law.

Prior to the Supreme Court decision in the Phillips case the commission abandoned the so-called "public utility" approach in determining the value of gas produced by Panhandle Eastern Pipe Line Co. under which gas produced by the pipeline company was priced on the basis of its historical cost and used the "fair field price" approach which recognizes the intrinsic value of gas as a commodity.

A similar point was made in a talk by S. L. Digby, member of the Federal Power Commission. In expressing his personal viewpoint, Commissioner Digby pointed out that it is the duty of the FPC to enforce the Natural Gas Act as it is interpreted by the Supreme Court. As a consequence of the Phillips decision, he said, the FPC suddenly found it necessary to assume the new and added jurisdiction over the independent producers without rules and regulations reasonably applicable to such an operation.

In his introductory remarks to a lengthy question-and-answer discussion of the subject, Willard W. Gatchell, general counsel for the FPC, also pointed out that it was the Supreme Court decision that brought the producers and gatherers of natural gas under FPC jurisdiction. The decision in this matter, he said, argued that in the Natural Gas Act, Congress sought to regulate natural gas at both ends of the system.

In general terms the far-reaching implications of the decision and resultant FPC order were summed up in the following question by Mr. Rather: "In what manner can the natural gas regulatory problem, as affecting the price of gas at the source, be handled so as to make the most natural gas available for public consumption at attractive prices over the longest period of time?"

At the present time, the FPC and the public are confused and are confronted with a serious problem as the result of the decision. It seems, as pointed out by Mr. Rather, as if it were the court's intention to force this problem before the Congress.

Wisdom of conservation

Commissioner Digby came to grips with the problem in pointing out that approximately one-half of the states in the nation have modern and effective conservation laws to prevent the physical and economic waste of oil and gas. The wisdom of these laws, he said, is established and generally accepted.

He emphasized that "the concept and indeed the cornerstone of interstate gas transmission, distribution and sale to the consumers has always depended upon long-term contracts supported by ample reserves of natural gas. There have been built up in the practice of the FPC in certificate cases requirements of proof of long-term sale contracts supported by known gas reserves of 15 to 20 years' supply. It appears to me that this has been a sound policy and was necessary in order to warrant the great financial expenditures in the building of transmission lines, distribution systems and conversion by the consumers to the use of natural gas.

"It is generally known that the financial markets and the thousands of secur-

ity holders necessary in long-line financing have depended upon the sound judgment of the FPC concerning the financial feasibility of these undertakings. The soundness of this approach has certainly warranted the confidence placed in the judgment of the FPC by the public.

"The exercise of the right of contracting parties," he continued, "to forecast the commodity value of gas during the life of the contract has been an important factor in these agreements. Like other commodity values, the price of gas has increased with growing market demand and expanded transportation facilities. The American enterprise system of meeting such problems by private contract, influenced by rugged competition, has afforded a large measure of assurance both to security owners and the consumers of gas.

What about dedication?

"Now since the independent producers and the transmission companies are natural gas companies subject to the same regulations, how will the long-range sale contract and dedication of gas reserves be affected? The right of a natural gas company to sell its reserves was supported in the Panhandle Eastern Pipe Line Co. decision. If an independent producer, now a natural gas company under the act, can likewise sell its reserves, how would this affect existing long-term sale contracts supported by a dedication of reserves? This question might possibly bring into focus the financial stability of a very large industry, and this in addition to the influence it will have on future contracts."

Commissioner Digby concluded his remarks on this subject with the opinion that the public interest requires changes in the Natural Gas Act. Although he did not presume to suggest the extent or the nature of the amendments needed, he did show concern for changes that would serve as greater protection of the consumers and the owners of outstanding securities.

Also, as a general approach, he suggested that effort should be made to attain the highest degree of efficiency in regulation. This would require cooperation between all parties that would not only be mutual but must also be voluntary and free of coercion.

With reference to the manner in which the INGAA proposes to oppose the Supreme Court decision, Mr. Rather in his annual report to the convention, pointed out that the association's program of public information had gotten underway none too soon. "The industry," he said, "as a result of the Phillips decision finds itself in a position where it is now even more important that the public understand the nature of the natural gas business and the differences between it, particularly insofar as the discovery and production of natural gas is concerned, and the types of enterprise that have traditionally been regulated as public utilities."

Facilities - - or service?

The question-and-answer period engaged in by Willard W. Gatchell and William S. Tarver delved into matters of a more specific nature. For instance, with reference to a question on whether or not the FPC order applies to the "facilities" of producers and gatherers, Mr. Gatchell pointed out that the FPC is authorized to issue certificates for "service" rather than for facilities. He was of the opinion that eventually the matter of to what extent the producers' facilities come within the jurisdiction of the FPC must come before the court for decision. Only in this manner will the question of control over facilities be answered.

Mr. Gatchell added that the Supreme Court case dealt only with the Phillips Petroleum Co. in its decision. Those matters not pertinent to this particular company operation were not ruled upon.

In answering a questtion with respect to the jurisdiction of the FPC over casinghead gas, Mr. Gatchell pointed out that the Natural Gas Act is, among other things, concerned with the "continuity of supply" of natural gas. This, in his opinion, brought control of those producers handling casinghead gas within the realm of the FPC as interpreted by the Phillips case decision.

A particularly important point, and one which has been brought out in the many requests for hearing that have been received by the FPC, is the matter of whether or not the FPC is permitted to issue an order, such as its Order 174-A, without first permitting hearings and giving notice. Mr. Gatchell pointed out that the FPC has administrative discretion in this matter, which would allow such action.

In the matter of the Texas state tax, as well as any similar tax imposed on independent producers, and the resultant escalator price increase in the cost of gas, Mr. Gatchell said that the commission's staff has recommended that these taxes be considered a "cost of service" item.

The INGAA adopted this resolution

WHEREAS, the Supreme Court of the United States, in an opinion handed down June 7, 1954, held that the Phillips Petroleum Co. was a natural gas company and, as such, was fully subject to regulation by the Federal Power Commission under the Natural Gas Act, and,

WHEREAS, the Phillips decision will, unless the Natural Gas Act is appropriately amended, have a profound effect upon the natural gas industry by subjecting the sales of natural gas of all producers entering interstate commerce to federal regulations and thus, by law, force upon such producers a public utility status which they have not voluntarily undertaken and which the Congress never intended that they should assume, and,

WHEREAS, the association is strongly convinced that the business of producing natural gas is not a utility operation, that natural gas is a commodity similar to oil, lumber, coal and other commodities essential to our economy, and the consumers interest can best be served in our free economy by a field price regulated by the law of supply and demand in the same manner as the prices of other commodities are regulated, and,

WHEREAS, the federal regulation of producers will therefore hamper and artificially retard exploration for and the discovery of new natural gas supplies and the orderly development and the maintenance of adequate conservation practices in the production of known reserves, and will tend to lessen the availability of adequate supplies of gas to the consuming public, all to the detriment of the true national interest:

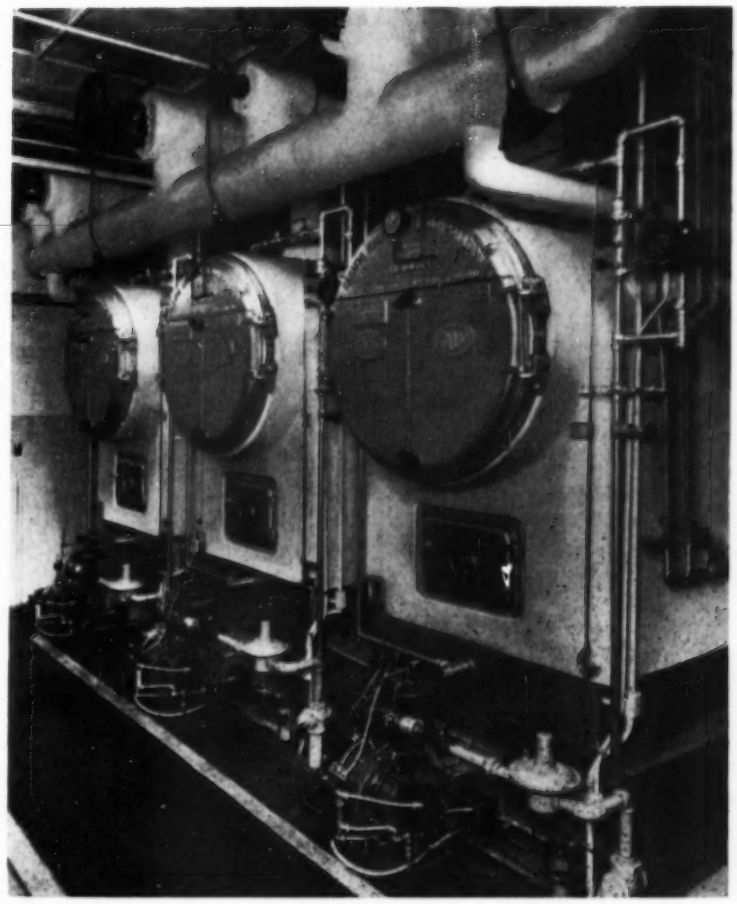
NOW, THEREFORE, BE IT RESOLVED, That the association does hereby recommend and urge that the Congress of the United States promptly enact at its next session appropriate legislation, amending the Natural Gas Act, which will free production of gas from the injurious burden which has been thrust upon it by judicial mandate.

New burners in state building prove highly satisfactory

By HAROLD C. HOOD, Field Editor

BECAUSE of limited peak-load supplies of natural gas in many areas, local gas companies are strongly urging commercial and industrial customers to install dual fuel burners in all new construction. They are also suggesting that existing installations, capable of operating only on gas, be replaced with units having provisions for using a standby fuel. During winter peak-load periods, and in cases of emergency shut-off of gas supply, a simple flip of a switch will throw the heating load over to oil and permit all available gas to be directed to domestic use. At such times, the gas company notifies the dual fuel customer in sufficient time to effect an easy changeover to the standby fuel and informs him when the critical period no longer exists.

The State Building in Los Angeles is one notable example where the use of modern, dual fuel burner installations has proven highly successful.



The above picture shows the three new burners shortly after installation in the State building boilers. A 33% reduction in gas usage over former burners is reported by the building engineer.

Switch to oil

Over an average winter heating season, the building is notified three or four times to switch over to oil during cold snaps. Total time on oil during such a winter is perhaps two or three weeks. The installation was completed last October at which time combination rotary burners, installed at the time of the building's erection 24 years ago and having had gas rings added to the burners later in the customary improved manner, were replaced by forced-draft dual fuel burners manufactured by the Mettler Co. of Los Angeles. Three Pacific Steel boilers of 50 hp each were involved. These are of the two-pass, fire tube design, and handle the entire heating load of the 12-story structure.

Efficiencywise, results from the new installations have been most gratifying. Whereas in the past two boilers were fired simultaneously on the average cold winter day, the past year has seen only one in operation on comparable days. This was possible primarily because of the up-to-date design and increased efficiency of the present burners. Gas consumption for heating the building has been reduced over 33%. On many earlier model combination burners, the adding of a gas ring was essentially an afterthought, and consequently they did not offer the desired performance. The new burners were engineered with the interchangeability of fuels as one of the foremost features, with gas being the primary fuel and oil the secondary.

The secret of superior operation of the burners lies largely in the proper mixing of the air and gas before it reaches the combustion chamber. All burners are solid, one-piece castings of the unique and exclusive Mettler design. Combustion air from the forced-draft fan is blown through the center into the mixing cavity where it is thoroughly agitated with gas entering through several jets cast into the block,

as shown in *Fig. 2*. When the unit is operating on oil, this is first converted to gaseous vapor, and the vaporized oil is then mixed with the carefully regulated supporting air for combustion. The mixtures, whether gas and air or oil and air, are initially ignited by an electric spark and complete combustion takes place close to the end of the burner.

Maintenance reduced

Because of the more complete combustion secured with the new installations, maintenance has been greatly reduced. In the past, fire tubes were scraped and wire-brushed regularly each summer. This was a dirty job and generally occupied two men for one week. Inspection after almost a year of operation with the Mettler burners shows tubes unusually clean. The amount of dust and soot throughout the boiler room has also been considerably reduced.

Another improvement in economy is found in a reduction in firebrick replacement. The usual procedure with the old installation had been to replace the front arch and some of the adjoining bricks in each firebox every summer. Four man-days were required for each boiler. Front arches and adjacent bricks today are in as good condition as when installed. With the new burners sufficient air for complete combustion at the heaviest loads is blown through the burner tube. Consequently, cold air entering the firebox through secondary ports, contacting the hot bricks and causing spalling and cracking, has been eliminated. Also, the fact that modulating fuel control is employed rather than straight "on and off" control, thereby minimizing rapid temperature fluctuation, contributes to longer life of the furnaces.

The original burners occasionally clogged up when on oil, causing constant pulsation at heavy loads. Indications are that the new burners, because of more complete combustion and elimination of sludge formation, will not do so. The amount of air required for clean, total combustion could not be supplied previously, whereas the motor-driven blowers on the present units are capable of furnishing more air than required under peak operating conditions, thus voiding the need for secondary air. The vastly reduced noise level of this new equipment is much appreciated by boiler room personnel. Since oil is now burned only during emergency conditions and for short periods of time, No. 3 light oil is used in place of heavy oil, reducing maintenance work and eliminating the need for pre-heating the fuel.

Safer operation has been effected through installation on the new burners in several ways. New features incorporated in the "Entrained Combustion" design make flame stability independent of burner location and furnace construction. The mechanical draft feature insures an adequate volume of air to support combustion without the aid of kindling temperatures from brick walls; such other independent factors as stack height, furnace suction or draft and temperatures are also modified and less essential.

In the event that the flame should be extinguished, or for any other reason fail, an electronic device will immediately shut off all fuel. The amount of fuel to the burner is regulated by carefully designed pressure controls, all scientifically combined to increase safety of operation and decrease maintenance costs.

This mechanical draft burner furnishing 100% air requirements for gas or oil represents a major advance in dual fuel burner development designed especially for the gas industry. The manufacturers now furnish this new modern burner in various sizes from 25 to 500 hp with any grade of gas or oil usable.

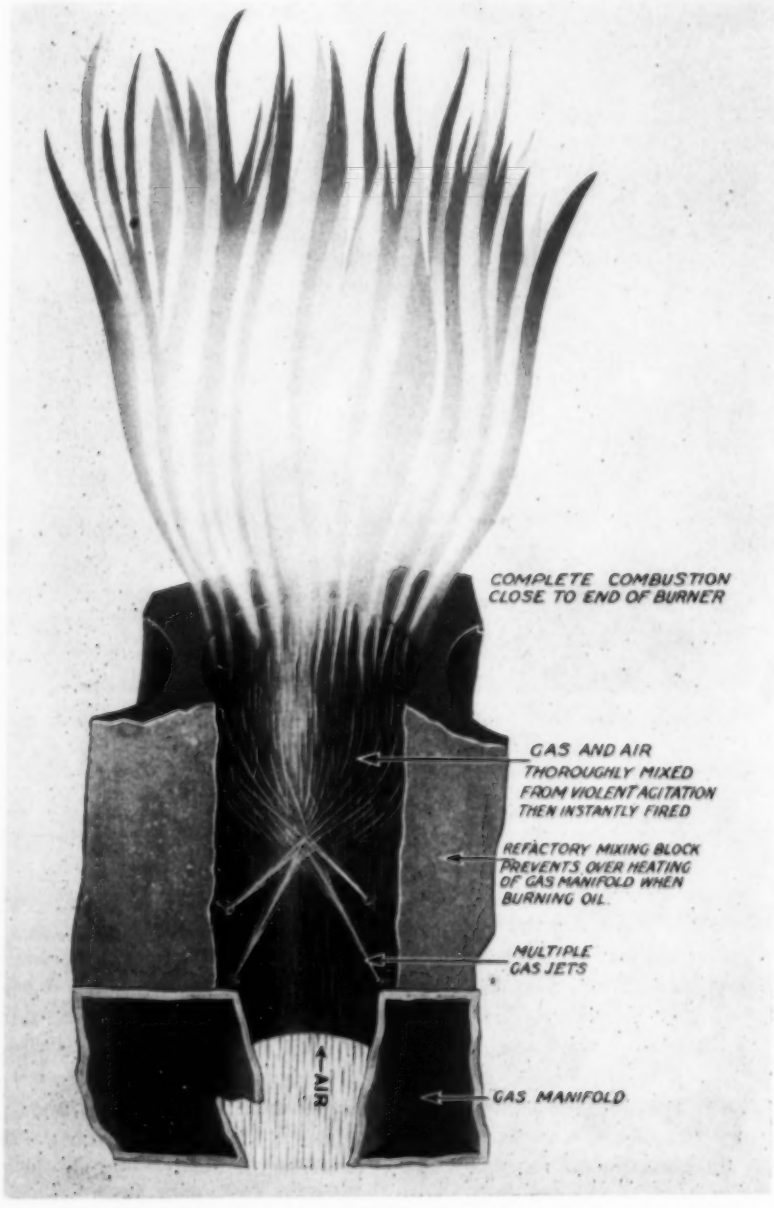


Fig. 2. A section through the Mettler burner unit. Note the way in which the gas and air are thoroughly mixed within the block before ignition.

Establishing a rate policy when converting to natural gas

An establishment of new rate schedules upon the introduction of natural gas to an area continues to be one of the major headaches for gas utilities, especially in view of changing price relationships as complicated by long-range uncertainties in wholesale prices. Walter J. Herrman, vice president of Southern Gas Co., had some advice for Pacific Northwest utilities at last month's PCGA convention which is applicable with almost equal force throughout the nation.

By WALTER J. HERRMAN

MANY people are inclined to think that with the importation of natural gas to a community, existing problems associated with the distribution of manufactured gas will evaporate and disappear. I know, for example, that the financial people often seem to take it for granted that a natural gas supply means automatically higher earnings and improved prices for securities. Consumers, on the other hand, expect lower rates for an improved product. Perhaps these various expectations may materialize, but that they will come about without considerable effort on the part of the utility company is, in my opinion, a naive expectation.

Let's start with things as they are today. Assuming a typical manufactured gas company—it probably is having quite a struggle to compete with the electric company for the cooking, water heating and refrigeration loads, and with the fuel oil or coal company for the space-heating load. The production department is having its headaches finding satisfactory markets for by-products without which the cost of gas may be prohibitive. The rate of earnings on invested capital is usually on the low side, and financing to take care of expansion is costly and difficult. One advantage, which may not always be appreciated, is that the entire operation is local and within the direct control of management.

Now let's assume that a pipeline comes snaking around the mountain with an offer of natural gas. The prospective available supply is large in relation to present sales, the price per therm is generally lower, and the heat content of the gas is perhaps twice that of the present manufactured product. On the other side of the coin, the distribution company finds it must sign up for certain minimum quantities, which must be paid for whether they are used or not. Next, it finds it has no control over future supplies or prices. Unlike a utility, the pipeline company has no obligation to expand its facilities in the face of increased demands. As to price, that is fixed in far-away Washington, with new and strange variables involved over which the purchaser has no control.

In these circumstances, numerous important decisions are necessary, but before these decisions can be made, many facts must be explored. Among the first requirements is a market survey of potential loads at various alternate prices for service. Prospective load factors must be studied, not only from the viewpoint of required distribution facilities, but as a means of determining probable costs of pipeline gas, and to make comparison with the cost of peak shaving by use of existing production facilities for manufactured gas. What, if any, is the potential market for interruptible business to industry or to steam-electric plants to fill summer valleys, and what is the competitive fuel situation? What, if any, are the possibilities for underground or other types of storage?

Given answers to these various questions and to some others which I do not have time to mention, the utility can begin to plan a sales program. As a part of that program, rates must necessarily be designed to attract and hold the business and to produce a profit on the required incremental investment. Let us look, therefore, at some of the known or expected factors in the present situation in the Pacific Northwest and in a general way endeavor to discover some of the benchmarks which might be involved in designing rates for a typical company facing natural gas

"In 1950 we in southern California were paying about 14 cents a thousand for out-of-state gas versus today's price of 21 cents—an increase of 7 cents per Mcf or 50% in only four years. A similar increase of about .7 cents per therm in the proposed rates of the Pacific Northwest Pipeline Corp. would result in a cost of 4.2 cents per therm at 70% load factor, or only 12% less than the present cost of manufactured gas now being produced by the Portland Gas & Coke Co."

distribution for the first time. In reviewing such data, I will refer principally to the two major cities in the area, Seattle and Portland, and to provide the statistics quoted an independent frame of reference, I will give certain comparisons with the Los Angeles area, where natural gas service has been established for many years.

One of the obviously important factors underlying the prospective market for natural gas is the saturation characteristics of the present service. As may be expected, the customer saturation in the Pacific Northwest is low, and actually has been declining, both absolutely, and in relation to the population. In Seattle, for example, there is only one gas customer for each 27 persons living in the serving area; in Portland the figure is about one to eight, while in southern California, the ratio is 1 to 3.5. These comparisons provide us with some measure of potential growth, disregarding for the moment the factor of intrenched competitive service.

Another element is the saturation of residential heating customers and the resultant average consumption per customer. In contrast to the decline in total number of customers, both Seattle and Portland have steadily been increasing the percentage of space-heating customers over the years so that currently more than 25% use gas for comfort heating. As a consequence, the average annual consumption per customer has grown in Seattle from 226 therms in 1944 to 333 therms in 1953, and in Portland from 268 therms to 421. The opportunity for further potential growth in this quarter may be gauged by the fact that Southern California Gas Co. has practically 100% space-heating saturation, and in spite of a much warmer climate, the average use per residential customer is approximately 800 therms.

This brings us to another statistic, the heating potential related to climate. The standard criterion here is the degree-day deficiency—in others words, the annual total of the degrees each day by which the mean temperature is less than 65°. In the Pacific Northwest, the annual degree-day deficiency is about 4000; in southern California it is about 1800. Assuming an annual heating load of about .22 therms per degree day, the indicated potential space-heating usage per customer would be about 880 therms in the Northwest, versus about 400 in southern California.

Taking Portland as an illustration, the non-heating consumption for an average residence is about 220 therms a year. In southern California, due presumably to a greater saturation of two- and three-use appliances, the corresponding average is about 400 therms. Thus, on a potential basis, we might estimate a total consumption of approximately 1280 therms a year for a full-use residential customer living in a Pacific Northwest city. Based on a ratio of one gas meter for every 3.5 persons, we could extend this hypothetical calculation further by applying this unit consumption to approximately 400,000 potential natural gas customers in the Seattle-Portland service area, giving us a total annual load potential of approximately 500 million therms. By way of comparison, this is almost 12 times actual residential sales of the two local gas utilities serving this territory in the year 1953.

Let us look next at some satistics on gas costs and rates. At the present time, both the major Northwest gas companies supply manufactured oil gas with a heat content of about 550 Btu per cu ft. The natural gas to be imported will have a heat content of approximately 1000 Btu per cu ft. One important result is that the capacity of existing distribution facilities will be increased by approximately 80%.

Seattle Gas Co.'s manufactured gas, according to its 1953 report, cost, after by-product credits, approximately 40 cents per Mcf, or about 7.5 cents per therm. In Portland the comparable cost was 4.8 cents per therm.

The proposed city gate rate for natural gas to Seattle and Portland is 32.1 cents per month per therm of billing demand plus 2 cents per therm, which equates to 3.05 cents per therm at 100% load factor, and to 3.5 cents per therm at 70% load factor. By way of comparison, the El Paso Natural Gas Co. rate for 1100-Btu gas delivered to the southern California companies at the Arizona-California boundary at Blythe, is $1.62 per month per Mcf of demand plus 16 cents per Mcf. At 100% load factor, this equates to 21 cents per Mcf at Blythe and about 24 cents per Mcf or 2.2 cents per therm delivered to the Los Angeles basin. At our system load factor of about 70%, the average cost of gas to southern California companies, from all sources, is about 2.5 cents per therm. As another comparison, the typical city gate rate for natural gas in New England is $4.75 per month per Mcf of demand plus 31½ cents per Mcf, or about 52½ cents per Mcf at an average load factor of 74%.

At an assumed 70% load factor, the new pipeline rates in the Pacific Northwest would represent a reduction in gas costs of about 53% to the Seattle Gas Co. and of about 27% to the Portland Gas & Coke Co. A word of caution should be added, however, about accepting any pipeline rates for the future. As I mentioned a moment ago, these rates are fixed in Washington, and the factors upon which they are predicated are subject to change wholly out of the control of the purchasing company. In 1950 we in southern California were paying about 14 cents a thousand for out-of-state gas versus today's price of 21 cents—an increase of 7 cents per Mcf or 50% in only four years. A similar increase of about .7 cents per therm in the proposed rates of the Pacific Northwest Pipe Line Co. would result in a cost of 4.2 cents per therm at 70% load factor, or only 12% less than the present cost of manufactured gas now being produced by the Portland Gas & Coke Co. While the considerations which caused such increases in the cost of out-of-state gas to southern California may not be comparable here, it is obvious that any material increase in the pipeline rates to the Pacific Northwest would have a relatively large impact on the potential savings in gas costs, especially to a company whose costs of manufactured gas are already fairly low.

Coming now to the rates charged, it should be pointed out first that present

"Looking at the objective of keeping general service gas rates as low as possible, it is good economics to sell maximum volumes to industry at rates fairly close to what the traffic will bear, but this in turn imposes increasing risks of large revenue losses in the event of a drop in competitive fuel oil prices."

"While the cost of gas is important, it still represents a minor fraction of the total cost of doing business, and to the extent that total revenues can be augmented by space heating business with little or no incremental expense except the cost of gas, the overall return can be increased, or overall rates can be reduced, or both."

gas sales in the Pacific Northwest are very largely restricted to residential and commercial customers, since the base cost of manufactured gas made from oil naturally exceeds the cost of oil to industrial customers. This circumstance is largely responsible for the relatively high average rate of 24 cents per therm in Seattle and 18 per therm in Portland, compared with about 4.6 cents per therm in southern California. Breaking these figures down into class averages, the Seattle rate averages 27 cents per therm for residential use, 23 cents for commercial and 16.5 cents for a small amount of industrial service. In Portland, the residential rate averages 18.5 cents per therm and the combined commercial-industrial average is 18 cents. In southern California, by contrast, the combined residential-commercial average is 7.2 cents and the firm industrial rate averages 4.1 cents per therm, the latter being 0.7 cents less than the average cost of manufactured gas in Portland.

Another useful comparison is the revenue per residential customer. In Seattle, the average is $61 a year for customers using gas for cooking and water heating, and $203 where the usage includes space heating, with an over-all average of $90. In Portland the over-all average is $78 a year, while in southern California, with practically 100% space heating saturation, the average is only $59. Of these totals, the cost of gas represents about $25 or 28% in Seattle, about $21 or 27% in Portland, and $20 or 34% in southern California. Stated otherwise, the dollars left over for all other costs average about $65 per customer per year in Seattle, $57 in Portland, and $39 in southern California.

One of the major factors contributing to the apparent lower costs in southern California is the relatively high rate of return earned by the large interruptible loads, the profit on which is in the nature of a credit to the residential service. For example, a cost study in the pending Southern California Gas Co. rate case shows that the residential and commercial service, as a class, earned only about 4% on the allocated plant investment in 1953, whereas the interruptible industrial load, including sales to large steam electric plants, earned about 16%. Such differentials are justified, in the opinion of our management, and presumably in the opinion of the public utilities commission, because rates to the interruptible customers are geared principally to the value of the service, rather than its cost. For one thing, these customers would not buy natural gas unless it were cheaper than competitive fuels. Further, the business is highly marginal and subject to a considerable element of risk. Finally, of course, the service would not be available at all except for the basic residential load which makes a long-distance pipeline economically feasible in the first instance.

Actually, the firm and interruptible business are mutually beneficial to each other; the firm makes the interruptible possible, and the interruptible, in turn, helps to support the firm. In our company we try to balance these complementary interests by fixing interruptible rates at a judgment level between the cost and value of the service rendered. As the price of primary gas rises and approaches the cost of competitive fuels, we reach a point of delicate economic balance. Looking at the objective of keeping general service gas rates as low as possible, it is good economics to sell maximum volumes to industry at rates fairly close to what the traffic will bear, but this in turn imposes increasing risks of large revenue losses in the event of a drop in competitive fuel oil prices. In my opinion, the same factors will have to be subjected to a careful economic balance in the Pacific Northwest if the total natural gas business is to be developed to its maximum potential.

This leads us to the very important question of fuel oil prices and interruptible gas rates. As I understand it, heavy fuel oil prices in the Pacific Northwest are geared to the posted price in California plus transportation charges of about 25 cents per barrel. Based on the present California posted price of $1.85 per barrel, the equivalent posted price in Seattle or Portland is now $2.10. As contrasted to posted prices, we must also give consideration to so-called spot prices which currently are about 30 cents lower, both in California and the Northwest. In part this is due to the increasing accumulation of Pacific Coast inventories since the end of the Korean war. Another probable factor has been the increasing importation of natural gas to the Pacific Coast, which in effect reduces the outlets for fuel oil. In other words, the utilities, by importing and selling natural gas to industry, which would otherwise burn oil, put a pressure on fuel oil prices, thereby undercutting their own sales potential. Except for periods when the country is at war, and all fuels are in short supply, this self-generated threat of fuel oil competition must always be taken into account in fixing rates for interruptible service.

Taking the presently indicated spot price of heavy oil of $1.80 a barrel as illustrative, the equivalent price of gas is approximately 2¾ cents per therm. Offhand, this three-quarters of a cent differential might appear to provide an adequate margin over the indicated commodity cost component of 2.0 cents per therm in the proposed city gate rate. Unfortunately, the answer is not quite that simple. As I previously pointed out, the actual rate should be fixed somewhere between cost and value, and obviously it must be fixed

"In certain cases it may be desired to promote the sale of heating service to customers who already have cooking and water heating appliances. This can be accomplished very simply by a relatively cheap follow-on rate beginning at about 30 therms."

"For one thing, I believe it will be desirable not to rely too heavily at this time on any large potential profits from the interruptible business. It would be preferable, in my opinion, to fix interruptible rates at levels substantially under the value of the service, in order to develop a well-established industrial load."

sufficiently below the value limitation so that the business will not be lost in the event of normal downward adjustments in the price of fuel oil.

At the other end of the scale, there is the problem of possible increases in the city gate commodity rate. Dealing as we are with marginal quantities, small changes at either extreme make large differences in the earnings from interruptible customers, and this, in turn, creates a secondary problem with respect to firm sales which may be dependent on an industrial subsidy. By way of comparison, the commodity cost component of out-of-state gas in southern California is about 1.5 cents a therm, whereas the equivalent price of spot fuel oil is about 2.6 cents, a differential of 1.1 cents per therm, nearly 50% greater than the corresponding margin here in the Pacific Northwest. Considering the fact that a gas company attempting to break into the industrial market for the first time must offer greater concessions in relation to fuel prices than a company with an established industrial load, the indicated gas-oil differential of .75 cent per therm is, in my opinion, on the low side.

So much for general background. Let's look more closely at the subject of rate levels and rate design.

My first suggestion is to give even more attention to space heating. While the cost of gas is important, it still represents a minor fraction of the total cost of doing business, and to the extent that total revenues can be augmented by space heating business with little or no incremental expense except the cost of gas, the over-all return can be increased, or over-all rates can be reduced, or both.

My second suggestion is a corollary of the first—to promote maximum consumption per individual customer. One customer using gas for three functions —cooking, water heating, and space heating—will produce a much higher net for return than two customers, one of whom has cooking and water heating only, while the second has space heating only. Promotion of such expanded usage per customer will be especially desirable in view of the increased delivery capacity of the distribution system resulting from the higher heat content of the natural gas to be supplied.

To accomplish these twin objectives, inducement type of rates should be considered, in which the unit charges are geared to the number of appliances in service. An adequate minimum fixed charge per month which includes, say,

"Don't be afraid, for the present, at least, of trial rates of unorthodox form, if it seems they will do a job that needs to be done."

10 therms, is a desirable feature, and I note that at least one of the major companies in this area has made much better progress in this direction than we in southern California. Given an adequate fixed monthly charge, the follow-on blocks might be divided into three sub-schedules, one of which would be applicable to heating only service, the second to heating plus one other major appliance, and the third to heating plus two or more major appliances. The basic level of the charges in these sub-schedules should, of course, be highest for the single use service and lowest for the multiple use service. Care should be exercised, however, that the terminal blocks of the sub-schedules are not so far apart as to permit a net reduction in the total bill in spite of increased total usage resulting from the addition of one extra appliance.

The form of rate just mentioned tends to promote combination or multiple service generally. In certain cases it may be desired to promote the sale of heating service to customers who already have cooking and water heating appliances. This can be accomplished very simply by a relatively cheap follow-on rate beginning at about 30 therms. Here again, however, one must take care to keep the terminal blocks high enough to cover the incremental cost of the seasonal heating load, as measured, for example, by the cost of gas produced by the use of peak shaving equipment. One such protection may be provided through use of the so-called stopper clause. For example, assuming a terminal block rate of say 6 cents a therm, a stopper clause might be provided to the effect that the average rate could not be less than say 8 cents a therm.

In other instances the situation may be as it is in southern California, where new homes, in particular, desire gas for heating, but may be inclined to use electricity for cooking, water heating, and refrigeration. In such cases, the rate should be designed accordingly with a fully adequate monthly fixed charge, and follow-on blocks having a winter-summer differential that will be compensatory insofar as the heating load is concerned, but at the same time provide a very low incentive rate for year-round service for the kitchen appliances. The importance of rates that will encourage new customers to make use of complete gas service is obvious in light of the fact that the population growth in the Pacific Northwest has been running about 100,000 a year, representing a potential of approximately 30,000 added gas customers annually.

Another type of rate that may have some application is the split rate. Section A of such a rate contains a relatively modest fixed charge with a fairly high follow-on charge designed principally to suit the requirements of non-

"To increase heating load and to promote maximum consumption per customer, inducement type of rates should be considered, in which the unit charges are geared to the number of appliances in service. An adequate minimum fixed charge per month which includes, say, 10 therms, is a desirable feature . . ."

"It may be necessary to move relatively slowly in the overall load development program. Care must be taken in this connection to distinguish theoretical potentials from practical probabilities."

heating service. However, when the total annual consumption or charge exceeds a certain amount, the customer is billed on Section B, with a considerably higher fixed charge and a lower follow-on rate. Bills under the two sections should approximately equate at the transition point at average load factors. This split rate is easy to administer and can be designed to follow costs of service quite accurately, but it does not have much more promotional value than the ordinary block rate.

Incidentally, I have referred throughout to rates related to consumption in therms. Where manufactured gas of low heat content is to be superseded by high-Btu natural gas, it is advisable that all rates be expressed on a therm basis prior to the conversion. Then, when natural gas comes in, the unit rate in effect will be reduced, whereas if the charge is related to volume, there would be an apparent rate increase.

With regard to rates for commercial and firm industrial customers, it is essential in general that these schedules be designed so as to adequately reflect seasonal variations in demand. In southern California, we have found that the simplest form of rate for this class of business is one with a winter-summer differential which provides a more or less automatic synchronization of prices and costs. If there is a market for firm off-peak service, it should, of course, be exploited.

Finally, we come again to the interruptible load, with its dual advantages of a large potential profit margin and complete curtailability during periods of firm peaks. It would be too much to expect, perhaps, that so valuable a load should not at the same time involve a high degree of risk. As previously mentioned, the risk is also double-barreled, especially in a territory such as the Pacific Northwest where development of the residential load is dependent on lower rates, and where lower rates, in turn, may be importantly dependent on prospective profits from the interruptible industrial service.

In these circumstances, it may be necessary to move relatively slowly in the over-all load development program. Care must be taken in this connection, to distinguish theoretical potentials from practical probabilities. One might calculate, for example, that with a reduction of x% in residential rates, the total volume of residential sales could be quadrupled, and at that volume the reduced rates would yield a return of say 5% on investment. With increased volumes of off-peak gas available for interruptible customers, it might be further calculated that the incremental profit on this business would be say 10%, and that the over-all return on total investment would be 6%.

The obvious flaw in any such theoretical calculations, of course, is that they are predicated upon a completed program, without regard for what may happen in the interim. Obviously, the mere act of reducing rates by any given percentage will not of itself induce all present customers of competitive services to switch immediately to gas. Over a long period, however, as customers' appliances wear out or become obsolete, and as people move from one location to another, it is perhaps reasonable to expect that an aggressive and continuing sales campaign might result in an increase of business along the lines indicated. The trouble is that until increased sales volumes are realized, rates cannot be decreased, and until rates are decreased, the increased sales potential cannot be achieved. The problem is further complicated in the Pacific Northwest by reason of the apparent marginal character of the profit from the interruptible business, which may disappear overnight due to either higher pipeline rates for gas or lower prices of fuel oil.

Is there anything that can be done rate-wise to mitigate some of these problems? Probably yes. For one thing, I believe it will be desirable not to rely too heavily at this time on any large potential profits from the interruptible business. It would be preferable, in my opinion, to fix interruptible rates at levels substantially under the value of the service, in order to develop a well-established industrial load. If rates can be made sufficiently attractive, it may be possible to induce some industrial customers to share with the company the cost of required extensions, refundable out of future profits. Under such an arrangement, there is a mutuality of interest which may help to hold the load, even in periods of adverse markets for competitive fuels. As a further protection, during times of declining oil prices, as well as a source of added revenues when oil prices may be rising, your interruptible schedules should contain suitable escalation provisions geared to the price of fuel oil.

One further suggestion for companies contemplating a conversion. Keep your rate structures fluid. An effective job of load building will require numerous changes to meet changing conditions. Don't be afraid, for the present, at least, of trial rates of unorthodox form, if it seems they will do a job that needs to be done. If possible, include in your rates a gas cost adjustment clause to reflect changes in the city gate price of gas, so that you will not have to go through a rate case every time the pipeline company raises its charges. Discuss these problems with your public utilities commission and endeavor to obtain from the commission the right to revise and adjust your rate schedules within reasonable limits without formal hearings.

"Another type of rate that may have some application is the split rate. Section A of such a rate contains a relatively modest fixed charge with a fairly high follow-on charge designed principally to suit the requirements of non-heating service. However, when the total annual consumption or charge exceeds a certain amount, the customer is billed on Section B, with a considerably higher fixed charge and a lower follow-on rate."

Portland spurns Pacific's "contract demand" offers

AT presstime, Portland Gas & Coke Co. was still a "holdout" in the Pacific Northwest natural gas picture and there was little prospect of its changing its position in the foreseeable future. A proponent of the Westcoast Transmission scheme for bringing gas to the area, Portland has declared that it has no intention of joining the intervenors in any court action seeking to overthrow the FPC's decision in awarding the certificate to Pacific Northwest Pipeline Corp. But neither is it set to sign up for San Juan gas until it has been assured that certain conditions are met.

Why it continues to resist the blandishments of the delegated carrier may be inferred in part from the foregoing article by Walter J. Herrman, which points out some of the economic difficulties and traps which face any utility that plans to convert to natural gas under the conditions peculiar to the Pacific Northwest. Portland's position was further delineated in a clarifying address made by Portland's President Charles H. Gueffroy before a meeting of the Northwest Group of the Investment Bankers Association in Gearhart, Ore., in mid-September.

The obvious differences in the situations encountered by the various distributing companies in the area were cited by Mr. Gueffroy in explaining his company's position. He said:

> Most of the small, high-rate gas distributing companies should have no difficulty in expanding their business as they will be able to buy natural gas on a flat rate basis considerably below their present cost of producing gas. This narrows the field down to the metropolitan areas of Portland, Seattle, Tacoma, and Spokane. A comparison of a few important statistics of the companies which serve those cities (see table) may give you an insight to the opportunities and problems faced by those companies—and will serve to show why our company has not signed any contracts with Pacific.
>
> The substantially lower production cost in Portland places an absolute ceiling on what Portland can pay for any quantity of natural gas, and obviously the cost of natural gas must be considerably below the cost of manufactured gas, if any substantial volume is to be sold, since existing generating facilities are also required for peak shaving in connection with natural gas operation.

In calling attention to the figures shown in the table, Mr. Gueffroy pointed out the "far greater" rate reductions possible in the other cities, as compared with Portland, at identical city gate rates—"and let me assure you that substantial reductions are needed even in Portland to sell the increased volume of natural gas necessary to make a pipeline successful."

Despite greater acceptance of space heating in Portland, as shown by the comparative figures, the possibilities of adding more heating business are "conditioned upon lower rates and the ability to improve the poor load factor of the type of business," he said.

Mr. Gueffroy is particularly concerned about the fact that "Pacific has made no formal filing of rate tariffs with FPC and I am informed the company has no intention of doing so until near the time for completion of the project." Until they are filed, no one will know what the cost of gas will be, he asserted. In the opinion of Portland's counsel, Pacific's tariffs exhibit as presented in hearings does not constitute a filing.

The type of rate proposed disturbs Portland, which is willing to buy on a "measured demand basis," but balks at the two-part, contract demand or "take-or-pay-for" rate as offered. (The gate rate figures under this form of tariff are detailed in Walter Herrman's article.) The combination of the two cost components would bring about a city gate rate of 3.5 cents per therm at 70% load factor. The proposed tariff provides for a minimum load factor of 65%.

> Now, let us take an example of how this would figure out if all should go well and how our company could be hurt if all should not go well. In our market studies for gas from Canada, we estimated that in the third year of natural gas operation we could sell just over 200 million therms with a maximum day demand on the pipeline of 600,000 therms. Incidentally, on a therm basis this would be an increase in our sales volume of 328% over our gas sales in 1953. Of the total sales of 200 million therms, approximately 50% represents estimated industrial interruptible sales in competition with low cost heavy fuel oil. At the proposed city gate rates the annual demand charge would amount to $2,311,200 for which we would not get a single therm of gas. The 200 million therms, if we had a market for that volume, at 2 cents would cost us $4 million, or a total gas cost of approximately $6.3 million for one year. These are slightly lower figures than Pacific used in its studies and estimates, and the company's officers have been knocking at our door expecting us to sign a firm agreement on that basis as other smaller distributors have done.
>
> Now, let us assume that their estimates are not realistic, and that the average city gate rates must be increased 1 cent per therm, which is not an unrealistic assumption in view of what has happened in many pipelines constructed in the past five years. A part of this increase would be reflected in the demand charge, and the remainder would be added to the commodity cost. In this connection, we are supposed to have signed a firm agreement for a maximum day demand of 600,000 therms which then cannot be changed merely because the city gate rate was increased, so we are stuck with a higher demand charge which then would be approximately $3.2 million. Yet our gas sales would drop 50% because we would be priced out of at least the competitive heavy fuel oil market, and our total cost of gas under the tariff would be $6 million, compared with a cost of $6.3 million for twice the amount of gas in the first example cited.

Portland Gas would have bought—and will buy—from Pacific on an annual measured demand basis, Mr. Gueffroy emphasized. On Aug. 19 the board of directors reaffirmed his own testimony to this effect in a resolution.

The wide difference in gas costs between the two types of tariffs was pointed out by Mr. Gueffroy in a hypothetical situation, projecting the same

Portland Gas & Coke Co.'s President C. H. Gueffroy, a supporter of the Westcoast Transmission plan for piping natural gas to the Pacific Northwest, feels that his company would take too great a risk by taking gas from the Pacific on any basis other than on an "annual measured demand."

load figures into a measured demand schedule.

If the city gate rate established should be as proposed, the volume of gas purchased would be approximately the same under both forms of rates. If, however, the cost of gas should be increased 1 cent per therm, with a resultant 50% decrease in the sales and maximum day demand, our demand charge would be computed on the basis of 300,000 therms instead of 600,000 therms, or approximately $1.6 million, which would be just 50% of the contract demand example cited. The commodity cost would be the same, so our total cost of gas for one year would be about $4 million, compared with $6 million on a contract demand basis. Measured demand has the further advantage of making each year a separate deal.

Portland feels it would have greater rate protection if it were to take gas from Canada, even on a contract demand basis, Mr. Gueffroy said.

The Westcoast project was a simple case of building a pipeline, buying gas from producers at fixed contract prices for a period of 20 years, and selling the gas in a ready market. The only unknown factor was the actual construction cost of the pipeline versus the estimated cost. We were afraid their estimate might be low so we negotiated some assurance for ourselves on that portion of the line in Canada which would not have the protection of the Natural Gas Act as to rate of return.

In our agreement with Westcoast, we permitted the border rate to be adjusted upward for an over-run in construction cost up to $4 million, with the understanding that any additional over-run would be absorbed by the Canadian Westcoast company. Westcoast could not make the same agreement on the United States portion of the line where the Natural Gas Act would apply, but as the cost of this portion of the line was only slightly over $20 million and there was no problem as to the type of terrain to cross, we felt quite sure that our exposure to a higher cost of gas would not exceed 5% or .015 cent per therm.

With Pacific, on the other hand, "which starts with the drilling of wells and ends with the delivery of gas . . . there are factors aside from the construction of the line itself that have an important bearing on the future cost of gas," he said. Included are the number of producing wells required, dry holes, drilling costs, reduction in depletion allowance, yields and prices of natural gas constituents. "Of course, the estimates might prove to be accurate, but the speculation would be too great and the price situation too marginal to justify our signing a long-term purchase agreement at costs presently unknown, particularly in view of the experience of other distributors buying from pipelines in other sections of the country." (See Mr. Herrman's article for examples.)

Portland Gas is particularly concerned with load factor problems.

Under local management and control in manufacturing gas this is not important because we can shut down any number of generators according to demands and weather conditions. In the past 12 months our system load factor was 40% and our gas production cost was 5.46 cents per therm. If we should merely substitute natural gas for manufactured gas at that load factor our cost at Pacific's proposed rates would be 5.89 cents per therm, or more than our present manufacturing cost. The chief opportunity for additional sales volume for natural gas from this line lies in the field of space heating which has an annual load factor of only 20%. Natural gas for that purpose and at that load factor would cost 11.8 cents per therm, or double our present cost of manufacturing gas, and obviously would be prohibitive.

The problem is to find ways and means of improving the load factor on purchases of pipeline gas to as high a point as possible to get the cost down. For instance, at 90% load factor the cost per therm would be 3.17 cents, or less than one-third of the cost at 20% load factor.

Portland is looking to industrial sales to bring up the load factor, said Mr. Gueffroy—yet Pacific testified that it does not believe there is a large volume of interruptible industrial load on the coast "because of the competition with fuel oil, which is low cost residual. We (Pacific) have not proposed any interruptible industrial sales on the coast."

On the other hand, "we (said Mr. Gueffroy) have never considered the matter of natural gas supply in this region without the belief that industries should be and would be benefited."

Where Portland's stand leaves the situation is difficult to determine. Pacific is assertedly going ahead with its plans regardless. The court might find error—however, FPC gave consideration to this plea in the rehearing and failed to so find. The commission made it clear that it was not in the public interest to "reserve" San Juan gas for California.

FPC also said that the Westcoast plan could not have been granted "even if there had been no competing applications. . . . The route of the (Westcoast sytem) is uncertain, estimated costs of construction questionable, and the design of the pipeline suspect, particularly with reference to numerous and hazardous river crossings. Upon the record before us we are unable to find what the probable cost of the Westcoast project would be. . . .

"We seriously question whether operating costs as estimated are adequate. Westcoast Inc. must depend upon large industrial sales to provide required revenue to meet operating costs and fixed charges. The record shows that competing fuels may well disrupt plans for large industrial sales and thus reduce the estimated revenues already too uncertain to warrant a finding that the project has assured earnings to meet the cost of operation and repay invested capital.

"Over and above these considerations is the question of an adequate and continuing gas supply. Upon this record we cannot find that the Westcoast project has an assured supply of natural gas. We have carefully reviewed the evidence of record and find that the route of the supply line from the Peace river area to the United States-Canada border extends through treacherous and difficult mountainous terrain where land slides, inaccessibility, deep snows and numerous river crossings make repair of any line break a matter of great consequence and emergency."

COMPARISON OF LOADS, COSTS, AND RATES OF MAJOR NORTHWEST CITIES

As of July 31, 1954	Portland	Seattle	Tacoma	Spokane
*Holder cost—cents per therm..	5.46	7.41	11.54	8.95
Average rate—cents per therm	19.9	25.2	25.94	31.20
Space heating customers.....	26,964	8,273	3,080	136
Total customers	86,674	36,743	12,828	6,837
Total sales—therms	48,312,733	19,610,761	4,904,833	1,412,066

*Holder cost is the cost of manufactured gas after credits for residuals and by-products produced.

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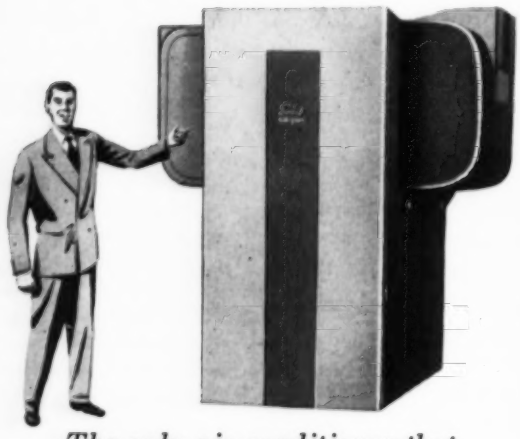

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GAS selected bibliographies

1. Corrosion — its causes and prevention

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1925

Preventing Soil Corrosion of Underground Piping, Dozier Finley, *Dec., p. 26.*

1926

Meeting the Problem of Electrolysis in Underground Pipe Protection, B. A. Williamson, *May, p. 13.*

1927

Surface Protection As Applied to Underground Pipe System, B. A. Williamson, *March, p. 22.*

Testing Soil for Corrosive Effects, B. G. Williams, *July, p. 34.*

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1929

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Economic Aspects of Pipe Protection, S. W. Binckley, *April, p. 38.*

Defying Swamp Action on Pipe, Frank W. Kirk, *June, p. 27.*

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1931

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Ground Moisture Survey of a Distribution Area, O. L. Wrestler, *June, p. 28.*

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Pilot Grounds for Cathodic Protection of Pipelines, W. R. Schneider, *Aug., p. 14.*

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Three New Soil Testing Instruments Described at Corrosion Conference, H. A. Brannon, E. F. Kindswater and L. M. Goldsmith, *Jan., p. 22.*

The Insulation of Structures Connected to Cathodically Protected Pipelines, H. J. Keeling, *April, p. 53.*

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Cathodic Protection on Treasure Island, W. R. Schneider, *Aug., p. 17.*

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Methods of Estimating the Corrosivity of Soils, K. H. Logan and E. A. Koenig, *Jan., p. 19.*

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   - Where and When to Use Insulating Flanges, W. E. Huddleston, *Jan., p. 31.*
   - "Pipe-to-Soil" Potential and Related Measurements, Dr. Gordon N. Scott, *Feb., p. 30.*
   - The Value of the Theory of Potential, Charles Kasper, *March, p. 33.*
2. Corrosion Coupons
   - Corrosion Coupons and Pipe Life Prediction, W. R. Schneider, *April, p. 39.*
   - The Cleaning of Corrosion Coupons, A. C. Alter and C. E. Lee, *May, p. 49.*
   - Apparatus for Cleaning Pipe Coupons, H. J. Keeling, *May, p. 54.*
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   - The Electronic Holiday Detector, D. E. Stearns, *July, p. 35.*
   - Use and Abuse of the Holiday Detector, W. H. T. Thornhill and R. C. Stromquist, *Aug., p. 35.*
   - Wax and Grease Type Pipe Coatings, D. R. Hiskey, *Sept., p. 51.*
4. Cathodic Protection, Theory and Research
   - Behavior of Zinc-Iron Couples in Carbonate Soil, T. H. Gilbert and Guy Corfield, *Oct., p. 32.*
   - Determination of Current Requirements, Kirk H. Logan, *Nov., p. 51.*
   - Methods of Determining Effectiveness, R. B. Mears and R. H. Brown, *Dec., p. 35.*

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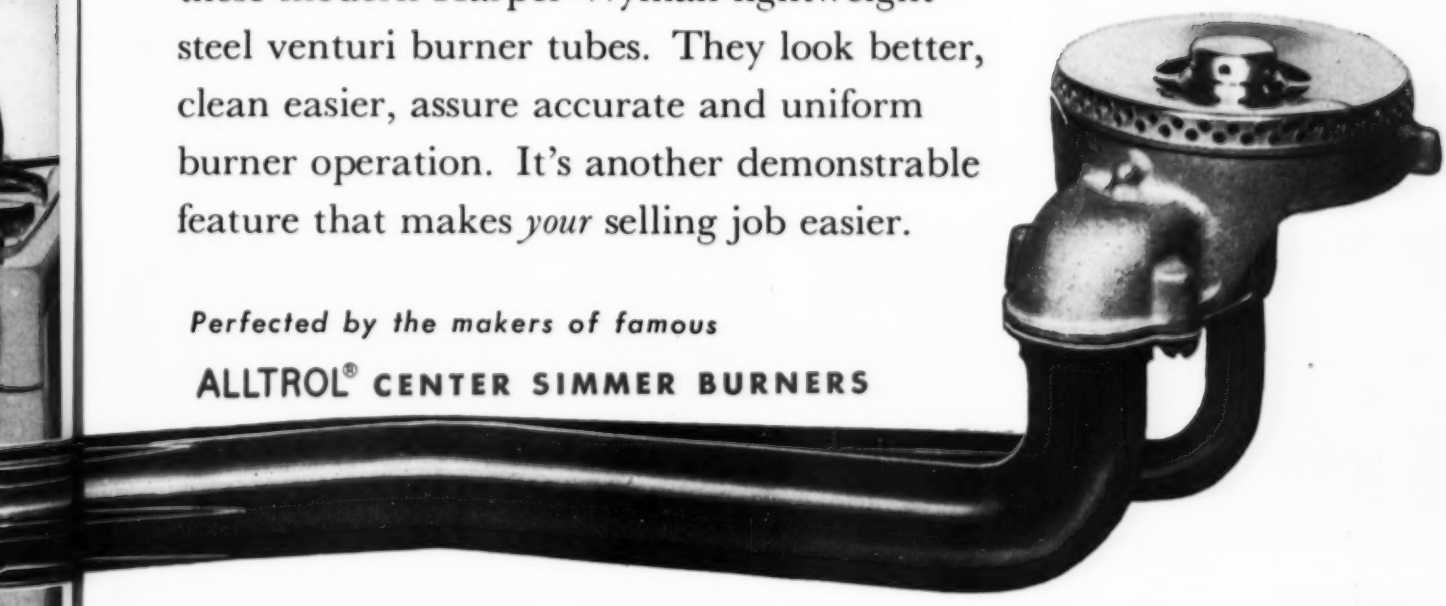

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ASSOCIATIONS

Full schedule planned for AGA convention

A FULL program featuring subjects ranging from landing gas loads to the latest legislation affecting the gas industry has been scheduled by the general convention committee for the three-day annual convention of the AGA at Atlantic City, Oct. 11-13.

The convention will be officially opened in the auditorium ballroom at 10:00 A.M. Monday by President E. H. Eacker, followed by the treasurer's report given by Vincent T. Miles. Mr. Eacker's address will present delegates with a pertinent review of industry conditions and association plans. The election of association officers follows next, and an inspirational address by Dr. Kenneth McFarland, educational consultant and lecturer for General Motors, will wind up the morning's program.

Sectional activities will take place on Monday and Tuesday afternoons. The operating section meetings will be held at the Claridge hotel with Chairman F. J. Pfluke, Rochester Gas & Electric Corp., presiding. At the Monday afternoon session he will read the section report. C. W. Wilson, Consolidated Gas Electric Light & Power Co. of Baltimore, will then submit the nominating committee's slate of candidates. Section officers will be elected and introduced. John E. Overbeck, Columbia Gas System Service Co., will read the report of the committee on gas measurement, and A. L. Vaughn, Northern Natural Gas Co., will deliver a paper on natural gas conditioning processes.

E. W. Kenefake, General Electric, will present an interesting feature devoted to remote control operation of pipelines covering closed circuits, color television, and instrumentation. A panel session on customer service, headed by W. W. Gilliss, follows. Panel members include Calvin Brown, Rochester Gas & Electric Corp., J. H. Dennis, Long Island Lighting Co., J. G. White, the Peoples Gas & Coke Co., Chicago, and W. M. Hawkins, Laclede Gas Co.

After presentations of awards Tuesday morning, Sheldon Coleman, GAMA president, and president of the Coleman Co. Inc., will open the second general session. With illustrated slides he will deliver a talk entitled "Who's on the Defensive?"

The executive vice president of Consolidated Gas Electric Light & Power Co., J. Theodore Wolfe, will bring delegates up to date on all facets of the Gas Industry Development Program in his talk: "The Gas Industry in Action." Effects of the last Supreme Court decision on his company and on other producers will be discussed by K. S. Adams, chairman of the board of Phillips, finishing out the second general session.

On Tuesday afternoon the operating section's award of merit will be made. F. A. Hough of Southern Counties Gas Co., chairman of ASA Subcommittee 8, will report on the work done on the code for pressure piping for gas transmission and distribution piping safety. John R. Gardner, Central Hudson Gas & Electric, will report for the subcommittee on customer load characteristics, and a report on the economics of a paint survey will be made by J. G. Geoghegan of Consolidated Edison. H. L. Hamilton, of A. V. Smith Engineering Co. will talk on insulating joints as a safety measure and D. L. White, Washington Gas Light Co., will head a panel on quality control.

The third general session will be opened Wednesday morning with an address by the president of Independent Natural Gas Association, followed by a discussion of the dynamic aspects that shape our economic lives and their impact on American business and industry by John J. McCloy, chairman of the board, Chase National Bank. Mr. McCloy has served as Assistant Secretary of War, and U. S. High Commissioner for Germany. D. A. Hulcy, president, Lone Star Gas Co., and past president, U. S. Chamber of Commerce, and past president, AGA, will close the session with a pertinent summary of events of the convention.

The accounting section will have an afternoon meeting on Monday, with talks by William D. Sweetman, the Peoples Gas Light & Coke Co., and Charles E. Reno, consultant from Canton, Ohio. Mr. Eacker will present the "Order of Accounting Merit" awards. At a luncheon meeting on Tuesday addresses will be made by Paul E. Ewers, Michigan Consolidated Gas Co.; Charles H. Mann, Columbia Gas System Service Corp.; Wesley Wiksell, Louisiana State University; and Bernard S. Rodey Jr., Consolidated Edison. Louis R. Quad, of Public Service Electric & Gas Co., Newark, will preside at the Monday meeting, and Arthur Skelton, the Peoples Gas Light & Coke Co., Chicago, at the Tuesday session.

The industrial and commercial section will hold a luncheon meeting on Tuesday, followed by an afternoon session. A meeting of the residential gas section will be held Monday afternoon.

L. L. Baxter, president of Arkansas Western Gas Co., will preside at a special feature of this year's convention—a "Team Up! — Land the Load!" meeting in the auditorium ballroom at 2:00 p.m. on Wednesday. Mr. Eacker, W. M. Jacobs, vice president of Southern California Gas Co., and E. Carl Sorby, vice president of Geo. D. Roper Corp., will deliver talks.

Incoming officers of the AGA, as pictured on the opposite page, are as follows:

Officers: F. M. Banks, Southern California Gas, president; Dean H. Mitchell, Northern Indiana Public Service, 1st vice president; C. H. Zachry, Southern Union Gas, 2nd vice president; Vincent T. Miles, Long Island Lighting Co., treasurer.

Directors: Ernest R. Acker, Central Hudson Gas & Electric; Paul Kayser, El Paso Natural Gas; Henry B. Sargent, Arizona Public Service; Dudley B. W. Brown, Milwaukee Gas Light; F. D. Campbell, New England Gas and Electric Assn.; Stuart Cooper, Delaware Power & Light; N. Henry Gellert, Seattle Gas; Donald C. Luce, Public Service Electric & Gas; H. N. Mallon, Dresser Industries; James F. Oates Jr., Peoples Gas Light; C. P. Rather, Southern Natural; E. Carl Sorby, Geo. D. Roper Corp.; W. T. Stevenson, Texas Gas Transmission; E. H. Tollefson, Hope Natural; George E. Whitwell, Philadelphia Electric.

Section Chairmen: A. T. Gardner, Delaware Power, accounting; W. Larry Shomaker, Northern Natural, general management; Ray Trowbridge, Seattle Gas, industrial and commercial gas; Walter H. Davidson, Transcontinental, operating; Walter H. Kurdelski, Michigan Consolidated, residential gas.

Section vice-chairmen: E. R. Eberle, Public Service, accounting; John H. Carson, East Ohio, general management; Lawrence E. Biemiller, Consolidated Gas Electric Light & Power Co., industrial and commercial gas; J. H. Collins Sr., New Orleans Public Service, operating; Frederic A. Hough, Southern Counties, operating section vice-chairman); B. H. Wittmann, Peoples Gas, residential gas.

Natural gas rumors feature PCGA convention

Before a backdrop of tenseness and uncertainty, the PCGA membership assembled last month in Vancouver, B.C. for the 61st time in what was the most interesting if not the most significant convention in its history.

It is doubtful that the timing of the association's first en masse excursion into British Columbia, its most northerly outpost, could have been more dramatic. The natural gas situation in the Northwest, which has ruffled some tempers and rent some friendships, appeared, at least in the minds of most delegates, to be a matter that is far from settled, and it so dominated the armchair conversations that little else seemed to be of much moment.

The unfortunate—for the programmers—fact that the FPC's decision was rendered in

midsummer prevented natural gas from assuming its rightful place in the agenda. Nonetheless, top honors were won by those papers that skirted close to the subject—the address of Walter J. Herrman (reproduced elsewhere in this issue), sounding some warnings in the matter of establishing post-conversion rate policies; the comprehensive and enlightening enumeration of "Problems of Changing from Manufactured to Natural Gas" by W. P. Woods of Conversions & Surveys Inc., New York; the amazing revelation of "British Columbia's Industrial Development," which served to underscore the opportunities that natural gas can help to unfold, by the province's Attorney General Robert Bonner; and the deeper meanings underlying the luncheon talk by Sen. J. W. deB. Farris on "Good Neighbors in a World of Discord."

Sharing gag-story that atom gas will soon replace natural gas are from left: W. C. Mainwaring, B.C. Electric; Ray Fish of Fish Engineering; H. L. Purdy of BCE; and Robert Herring of Fish Engineering.

Other business of the association occupied its rightful place despite the sometime preoccupation with natural gas matters. A slate of new officers was accepted, headed by E. D. Sherwin, president of San Diego (Calif.) Gas & Electric Co., who moved up from the vice presidency. Teammates include Guy W. Wadsworth, president of Southern Counties Gas Co., Los Angeles, as vice president; Harry McGann, auditor of division accounts, Pacific Gas & Electric Co., San Francisco, succeeding himself as treasurer; and, as directors, P. E. Beckman, vice president, PG&E; C. M. Sturkey, vice president, Seattle (Wash.) Gas Co.; James F. Bell, vice president, Portland (Ore.) Gas & Coke Co.; and J. F. Ray, vice president of General Controls Co., Glendale, Calif.

Annual awards for the top work in the association's annals for 1953-54 went to John J. Pugh, PG&E, a gold medal for his paper on forecasting system adequacy for heating loads; and to Nathan H. Gellert Jr., vice president of Seattle Gas, the Basford Trophy for the outstanding work of the technical section, which he headed. Honorable mentions went to the street use ordinance committee, headed by C. C. Westmoreland of Southern California Gas Co.; the customers service conference sponsored by J. N. Shrader, SoCal; V. C. Pack, SoCal, for his accounting paper; J. S. Powell and N. K. Senatoroff for their paper on hydrostatic testing; and Milford Springer, for his paper on workmen's compensation.

The committee award went to the clerical manpower standards group of the accounting section, sponsored by Carl Weiss of SoCal.

Delegates were treated to a solid and well-planned program of speeches. In a challenging presidential address, retiring leader W. C. Mainwaring, vice president of B.C. Elec-

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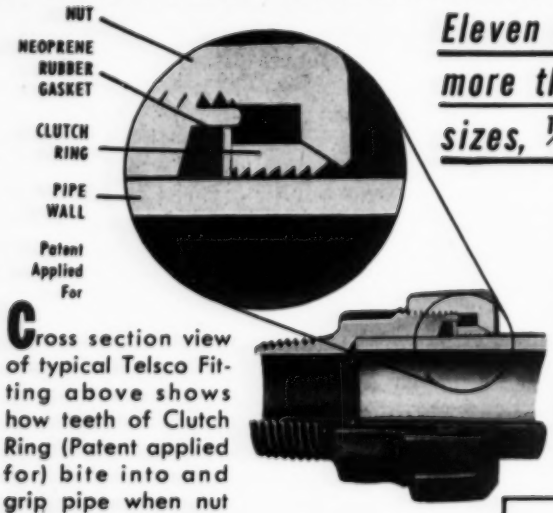

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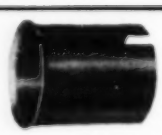

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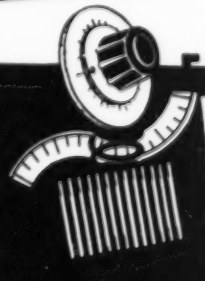

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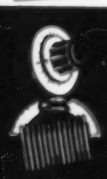

Mr. Controls

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tric Co., spoke of the crying need for closer bonds of cooperation between the national and regional associations.

"Perhaps the most important problem of management is to improve understanding, whether between management and workers, companies and industries, or industries and customers," he said. "Our industry associations are an important tool in solving our public relations problems, and I believe we should give them more support than we do. The officers, committee chairmen and staffs of our associations should have more contact with each other. The regional and state associations could shoulder with benefit to the industry many of the details now attempted by the national associations and be useful to

Aboard Princess Nanaimo on cruise to Vancouver Island were these four Los Angeles delegates (from left) Milford Springer, Southern Counties Gas Co.; Mrs. James Shrader; Mr. Shrader, Southern California Gas Co.; and E. M. Touissaint, Minneapolis-Honeywell.

the national associations in gaining the acceptance of industry units to the broad policies and projects which must have industry-wide support in order to succeed.

"What often happens when there is insufficient communication is that the national associations organize a project and carry it direct to the industry, giving the local association no definite assignment. Out of deference to the national association, the regional association stands aside, but it may happen that in doing so it abandons projects of its own which are conceived to meet local conditions. If the national project is not accepted, time is lost and nothing is accomplished.

"It is my recommendation that a very strong committee be set up representing the various regional associations now in existence and our national associations to study ways and means of carrying into effect the splendid programs that are being developed by AGA and GAMA so that the boards of these respective organizations might take some action in connection therewith."

Quotable were those thoughts of E. H. Eacker, president of AGA and the Boston Consolidated Gas Co.: "Do we or don't we view with alarm the fact that our electric competitor outsells us in many areas, especially in the higher priced units?

"Do we or don't we know that electric ranges are being sold to our customers where gas is priced the lowest on the continent and where those same customers use gas heating because they know it is cheaper than any other kind of fuel? If we know this, do we or don't we believe we must incorporate into gas appliances new features which will make them, without question, the most desirable units a housewife can obtain? Do we or don't we believe our customers dislike clumsy burners, difficult to lift out of a range, difficult to clean, useless for hours after washing, usually out of adjustment after cleaning, and that they would like simple burn-

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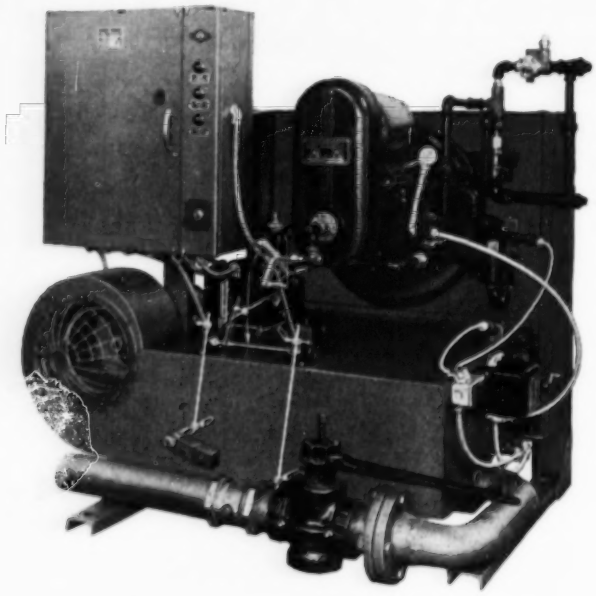

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These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

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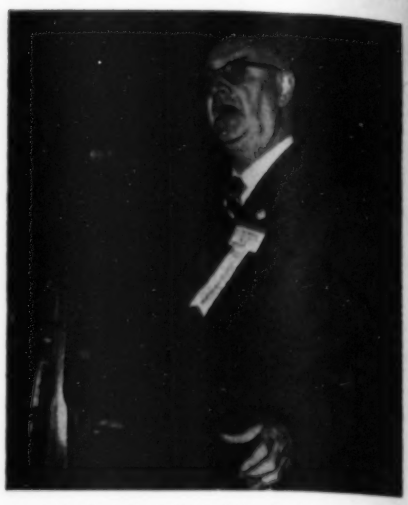
ers that are easy to clean, always in adjustment and which all burn alike?

"Do we or don't we believe our customers want a cool range—that constant hot spots give our competition ammunition and make our customers believe gas ranges are not cool when not in use? Do we or don't we believe a tiny 50-Btu pilot so small no heat is felt from it on the top of the range but which is stable with any kind of gas is an answer to this problem? Do we or don't we believe our customers want automatic appliances and that a burner which does not ignite or re-ignite at any position of the gas cock is not fully automatic? Do we or don't we believe our customers want appliances which they consider to be truly safe to operate?

"If we do believe these things to be true —and these are only some that I could mention—then we must believe the results of our PAR utilization research as worthwhile and that no time should be lost in incorporating the results into gas appliances.

"I look forward to the day when full automatic ignition on all range burners will be a requirement. In some cases original price only governs the purchase of appliances by public bodies and rules out automatic ignition. I have urged the incorporation into building codes of the ASA code for house piping and appliance installation Z21.30.

"Intensive efforts are under way to develop a PAR subscription basis for 1955 which will be acceptable to a larger number of gas utilities. All of the PAR activities are a continuing sound business investment and as such they deserve your continuing support."



Association President W. C. Mainwaring, vice president of B. C. Electric, delivers his report before turning over presidency to E. D. Sherwin of San Diego Gas.

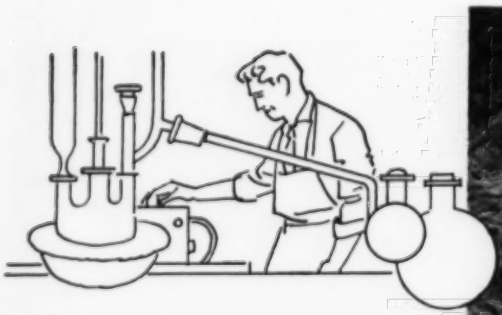
And Remick McDowell, vice president of Peoples Gas, Chicago, and chairman of AGA's public relations coordinating committee, who spotted some touchy public relations problems in his address, laid down these basic requirements for a company public relations program:

"It would seem essential that management concentrate the actual operation of the public relations program in experienced personnel who have the ability to recognize and deal with vital problems. Further, they should be individuals able to plan the proper program to meet the problems and to finally execute such a program.

"Bear in mind that those persons concentrating on the public relations field cannot be successful unless we accept the fact that we must be available to the press and other communication media at all reasonable times. The story as finally presented to the public by the press may not meet the technical requirements deemed necessary by accountants, engineers and lawyers. However, we must recognize that the representatives of the press are experts in their field, mass communication, as we are in ours. We in the utility industry are a means of gathering factual information for them to present and interpret to the general public—our customers."

CNGA plans fall meeting in Los Angeles

The 29th annual fall meeting of the California Natural Gasoline Association, scheduled for Oct. 7-8 at the Ambassador hotel in Los Angeles, will cover several subjects of interest to men in the gas industry. Highlights of the meeting will include a field



QUALITY CONTROL

MEANS LONGER LIFE THAN EVER

For McWANE-PACIFIC

CAST IRON PIPE

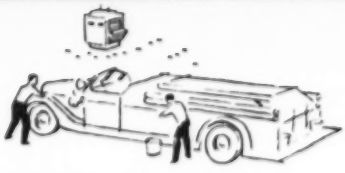
McWane-Pacific Cast Iron Pipe will make new records for long life because it is manufactured under a modern Quality Control System. Through every step of the McWane-Pacific manufacturing process, the raw materials first are analyzed, tested and checked, and finally each piece of McWane-Pacific pipe is tested and checked for soundness and strength.

Centuries-of-service records now are being made by cast iron pipe manufactured 100 to 300 years ago without benefit of these modern foundry methods and quality control. It is easy to understand why modern McWane-Pacific pipe will last even longer.

McWane-Pacific Super DeLavaud Cast Iron Pipe is made in 18-foot lengths, bell-and-spigot or mechanical joint, coated, uncoated or cement lined. Wire or write for details. McWANE CAST IRON PIPE COMPANY, Birmingham, Alabama. PACIFIC-STATES CAST IRON PIPE COMPANY, Provo, Utah. (Sales offices in principal cities.)

McWANE PACIFIC Q PIPE Lasts for Centuries

FIRE Under Control!



BACK IN THE DAYS of the prancing fire horses, the heating equipment at the fire station was often merely an old stove and a pile of firewood. In cold weather, stoking was practically a full-time job. When the stove overheated, the roof sometimes burned off the fire station, which entertained the public but was most humiliating to the firemen.

Today the heating stove has disappeared, along with the horses. Push-button heating, under precise automatic control, now helps keep the equipment ready to roll, and assures the men's comfort.

The Humphrey Model A Gas Unit Heater, pictured above in a Louisville fire station, represents modern automatic gas heating at its best. It has such Humphrey-developed features as Dual-Flame Burner with stainless steel tips; non-clogging pilot; Free-Flow Heat Exchanger with unrestricted, non-baffled interior; and Tilting Front. Both burner and fan are operated by accurate, automatic thermostat controls, while full 100% automatic safety controls provide the ultimate in protection.

In a fire house, heating equipment must operate 24 hours a day, 7 days a week. Humphrey Unit Heaters, for more than 25 years, have been demonstrating their ability to give peak performance in the hardest service.

Truly they are today's finest heating equipment, not only for fire stations but for every other type of commercial, industrial, and public building.

GENERAL GAS LIGHT CO.
KALAMAZOO, MICHIGAN

Humphrey
Greatest name in GAS UNIT HEATING

trip through Wasson Refinery, Richfield Oil Corp., Los Angeles county. A talk entitled "The Gas Industry Looks Ahead" by F. M. Foster, general manager of sales, Southern California Gas Co., will outline problems facing the industry in the near future.

The Thursday sessions will be grouped into five forums, the first dealing with wet gas gathering and to be chairmanned by E. C. Cunningham of Wilmington Gasoline Co. The second, on compressors and engines, will have R. E. Jenkins, Clark Bros. Co. Inc., as chairman; the third forum, on laboratory techniques and testing, will be presided over by Mark McIlvane, Chanslor Western Oil & Development Co.; Arnold Kelly of Union Oil Co.'s research center will chairman the fourth on plants and processing, and the fifth forum will consist of a management luncheon with George L. Tyler of duPont Nemours & Co. as chairman.

AGA and PCGA schedule joint convention

The 37th annual convention of the AGA will be held Oct. 17-19, 1955, in Los Angeles. The meetings will be held in conjunction with the PCGA, which has decided to forego its own separate convention in 1955. This combined event will be officially designated as the "1955 Convention of the American Gas Association and the Pacific Coast Gas Association." The PCGA will hold its constitutional annual meeting during the convention.

The initial meeting of the 1955 general convention committee was held in Los Angeles recently under the chairmanship of Robert R. Blackburn, vice president and secretary of the Southern California Gas Co.

Kurwin R. Boyes, secretary of the AGA, will serve as convention manager, and J. Edmund Kern, assistant manager of the PCGA, has been named associate convention manager.

The convention committee would be assisted in obtaining outstanding speakers through a special program committee headed by Robert A. Hornby, executive vice president of Pacific Lighting Corp.

More than 600 turn out for Appalachian short course

More than 600 representatives of the gas, oil, and chemical industries attended the 14th annual Appalachian gas measurement short course held at West Virginia University, Morgantown, Aug. 23-25. Eighty-four classes and four open forums were conducted, with more than 30 manufacturers displaying the latest developments in the field of measurement and regulation.

Highlighting the opening session were addresses by Mark V. Burlingame, vice president of the Natural Gas Pipe Line Co. of America and Texas-Illinois Gas Pipe Line Co.; and Homer W. Hanna Jr. of the Public Service Commission of West Virginia.

In his talk on the gas industry, Mr. Burlingame described the present need for storage fields and methods of utilization, while Mr. Hanna explained the functions of public service commissions.

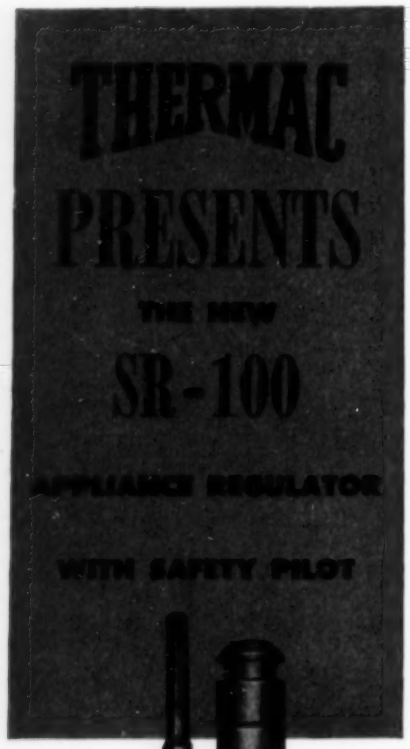
Howard S. Bean, of the National Bureau of Standards, was appointed program chairman of the 1955 short course and Al M. Hutchison, Ohio Fuel Gas Co., assumed the chairmanship of the general committee.

AGA and GAMA join forces for new service manual

In a joint effort with GAMA, the American Gas Association has prepared and published an up-to-date Gas Appliance Service Manual containing more than 280 illustrations and 400 pages of service instruction.

Designed so that it will not become obsolete, the new manual will be sold with an optional three-year supplementary service for new and revised instruction pages that can be easily inserted into the loose-leaf type manual. Eight issues of the supplements will be distributed during the three-year subscription period.

The manual is divided into three appliance sections covering clothes dryers, ranges, and water heaters. It illustrates and explains servicing of new developments in gas appliances.

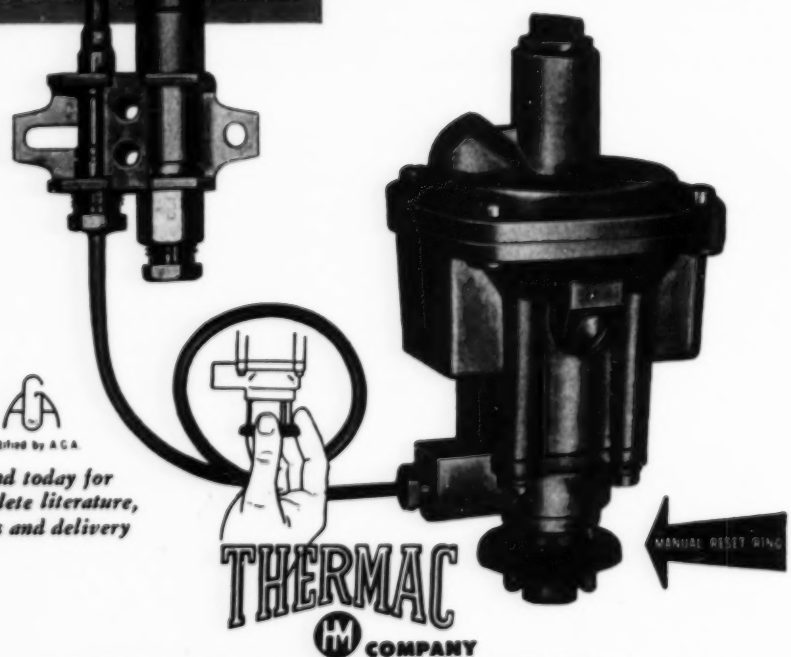


Specializing in gas controls for 23 years, our engineers now present the trade with a brand new product bearing the name THERMAC—the SR-100 Combination Appliance Regulator and Thermo Electric Safety Pilot for forced air furnaces, wall heaters, gravity and unit heaters, etc.

The THERMAC SR-100 offers finest gas control because the regulator is basically our famous T Series, of which millions are in daily operation. The time-proven thermo electric safety unit has been added and in so doing the appliance manufacturer can save several dollars on his actual cost because it eliminates the need for an electric relay or separate automatic pilot.

Positive and fool-proof in operation, the entire unit is ruggedly built to withstand years of service. For ease of operation a manual reset ring is provided at bottom of control.

Presently available in capacities up to 90,000 B.T.U. natural gas. Larger sizes to be announced.



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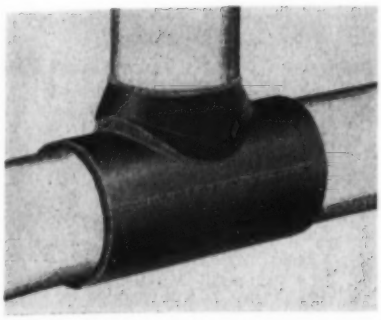

1 Split Tee

A new WeldOlet split tee, assembled and ready for field installation, has been introduced by Bonney Forge & Tool Works.

It is claimed that the new unit, which is specially designed for hot taps and new construction in the oil and gas transmission industries, "nails down the lid" where full encirclement reinforcing is necessary. It is engineered to meet size and service requirements from the smallest sizes to 30-in. outlets and for run lines through 36 in.

Bonney Forge & Tool Works

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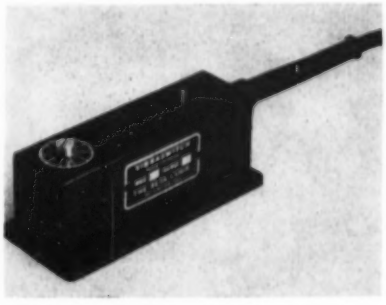


2 Vibrator Analyzer

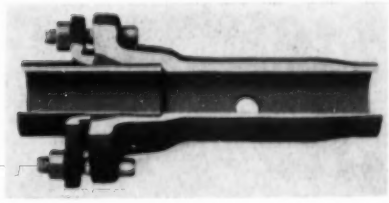
The Beta Corp.'s new Model 1 Vibraswitch may be used for vibration measurements or in a permanent installation as a protective monitoring switch to actuate a warning or shut down a machine when the vibration exceeds the normal value by a preadjusted amount.

Flat response from zero to above 200 cps permits use of the device on almost all types of rotating or vibrating equipment, including compressors, turbines, gasoline or diesel engines.

An internal SPDT manually resettable switch may be used to control circuits at up to 5 amp with vibratory displacement increases of as low as 10 microinches at 12,000 rpm.

Beta Corp.

■



3 Cast Iron Pipe

Cast iron pipe 2 in. and 2¼ in. in diameter and 18 ft long is now being made centrifugally with DeLavaud centrifugal casting machines by the McWane Cast Iron Pipe Co.

Made with bell-and-spigot or Boltite mechanical joints, the new pipe is furnished with a complete line of B&S or mechanical joint fittings. Both pipe and fittings may be ordered tar coated, uncoated, or cement lined. The 2-in. pipe weighs 6.2 lb per ft; the 2¼-in., 6.8 lb per ft, including the bell. Each length of pipe has a tapping collar cast integrally with the pipe behind the bell.

McWane Cast Iron Pipe Co.

■

4 Pilot Couple

An 80% reduction in heat as compared with the average gas appliance pilot burner has been achieved with a miniature pilot couple recently developed by General Controls Co.

The new pilot couple is an integrally combined pilot burner and thermocouple. The thermocouple is imbedded in the tip of the burner, and produces the electrical current for automatic operation of safety controls. The unit's bead size flame creates as little as 75 Btu per hour.

The PC-D low Btu pilot couple has been designed especially for gas appliances where a minimum of heat generation is desired in the pilot standby period. Secondary air only is burned in the miniature pilot couple.

General Controls Co.

■

5 Industrial Backhoe

Ottawa Steel Products new heavy-duty industrial backhoe has been designed especially for use with crawler tractors. The backhoe has an extended reach of approximately 15 ft and will dig to depths of over 9 ft.

Seven hydraulic cylinders and daul One-Trols are featured, as is the reverse positioned cylinder inside the main boom. This

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heavy-duty backhoe is available for mounting on the Allis-Chalmers HD-5G, International-Harvester models TD-6 and TD-9, and the Caterpillar D-4.

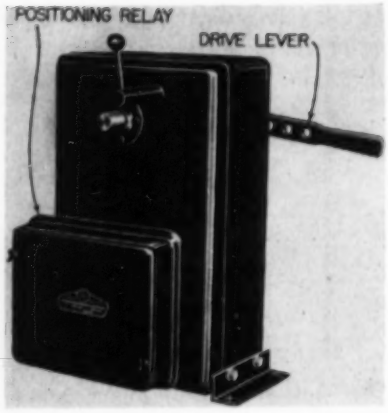
Ottawa Steel Products Inc.

■

6 Control Drive

A small, pneumatically operated control drive has been developed by Bailey Meter Co. to operate butterfly valves, dampers, feeders, etc., on a straight-line flow characteristic.

A pneumatic signal actuates a positioning relay, which, in turn, accurately positions a piston-operated drive lever arm. Three different characteristic cams are supplied and may be shaped if necessary.



The drive is compact and may be installed in any position on a column, pipe, or flat surface. Time required for full travel is adjustable. The drive has a 4-in. piston stroke at a torque of 75 ft-lb. It operates on a standard SAMA signal ranges 3-15 and 3-27 psig.

Bailey Meter Co.

■

Lancaster S-7 GROOVE TYPE METAL RIM DIAPHRAGM

Performance advantages of the Lancaster S-7 mean a closer to 100% overall accuracy — and an extra margin of profit. Patented Lancaster features and superior quality construction add up to more years of service in the meter — and another margin of extra profit.

If you are not using the Lancaster S-7 groove type metal rim diaphragm for your small meter repairs and replacements, write for a sample today.

Lancaster METER PARTS CO.

POST OFFICE BOX 378 • LANCASTER, OHIO

7 Printing Machine

The Pease Challenger is a fully automatic, high production white-printing machine. The Challenger, with automatic tracing separation feature, is a one-step feed machine. Printer and developer are synchronized to a maximum of 40 ft per minute.

Other features of the Pease Challenger are formica feed table, simplified print feeding, front and rear print delivery, print stacking at front and rear, electronic speed control, interlocking multiple roller developer, and metered ammonia control. The Challenger is finished in smooth, light gray Hammerloid enamel.

C. F. Pease Co.

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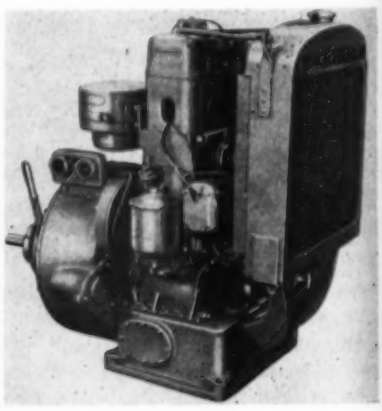


8 Gas Engine

Nordberg Manufacturing Co. has added a one-cylinder gas engine to its Power Chief series of small diesel prime movers.

Rated at from 9 to 18 maximum bhp

The Leading Gas Industry Publication

More circulation . . .
More editorial pages per issue . . .
More advertising pages per issue . . .
Lowest advertising cost per M —
28.7% less than the 2nd publication
and 39.4% less than the 3rd.

FIRST in Circulation

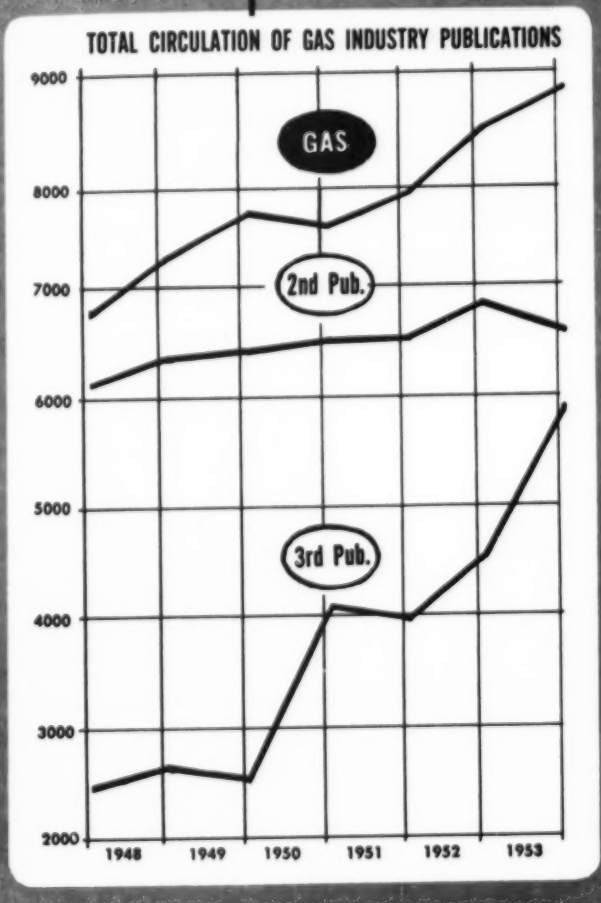
GAS gives you

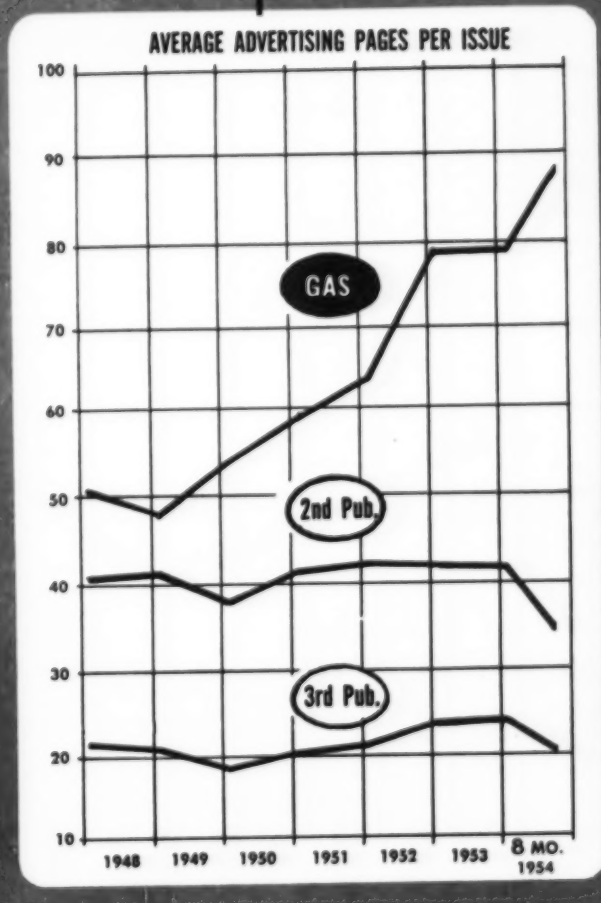
38.2% more total circulation
53.3% more in gas companies
133.3% more to men in charge of operations . . . than the second publication.
96% is to individuals.

FIRST in Advertising

GAS carries more advertising pages per issue than the next two gas publications combined.

Since 1945, GAS has gained 381 advertising pages (66.3%), while the second publication has lost 60 advertising pages (5.2%).





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within an operating speed range of 800 to 1800 rpm, the new engine has a 4½-in. bore and 5¼-in. stroke and is an extra heavy duty, vertical, spark ignition four-cycle engine. It is available as a complete, self-contained, ready-to-operate power unit with clutch power take-off and as a packaged generator set producing up to 10 kw.

Nordberg Manufacturing Co.

■

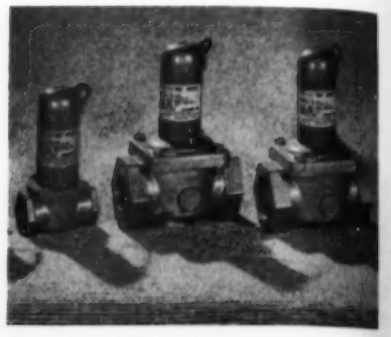
9 Crane - Excavator

Bucyrus-Erie's truck-mounted Hydrocrane, an all-hydraulic 4-ton, ⅜-yd crane-excavator, is now available as an independently powered machine.

The self-contained power unit, a 4-cylinder industrial type engine, permits the utilization of 58% more horsepower, and features an improved hydraulic circuit. A foot-operated selector valve permits hydraulic fluid from all three pumps to be channeled to one valve bank, increasing line speeds up to 50%. On the company's Hydrohoe, digging power is greater and hoist speeds faster.

Bucyrus-Erie Co.

■



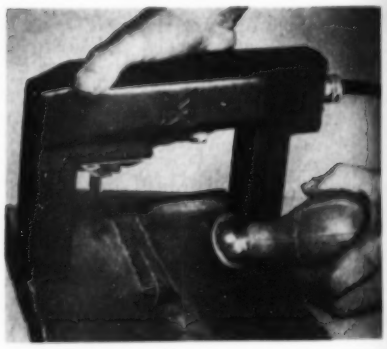
10 Solenoid Valve

A complete line of "DO" (diaphragm operated) solenoid valves is being produced by Eclipse Fuel Engineering.

The valves, designed for standby control of fluid flow and for automatic cycling operations, are available in six pipe sizes: ⅜-, ½, ¾, 1, 1¼-, and 1½-in. Eclipse DO valves are used for the control of air, water, oil, Freon 11, 12 and 22 refrigerants, natural, manufactured, propane and butane gases, and sulfur dioxide gas. They will operate on line pressures as high as 150 psi and as low as ½ in. of water. Ideal cycling range is from 40 to 60 cycles per minute.

Eclipse Fuel Engineering Co.

■



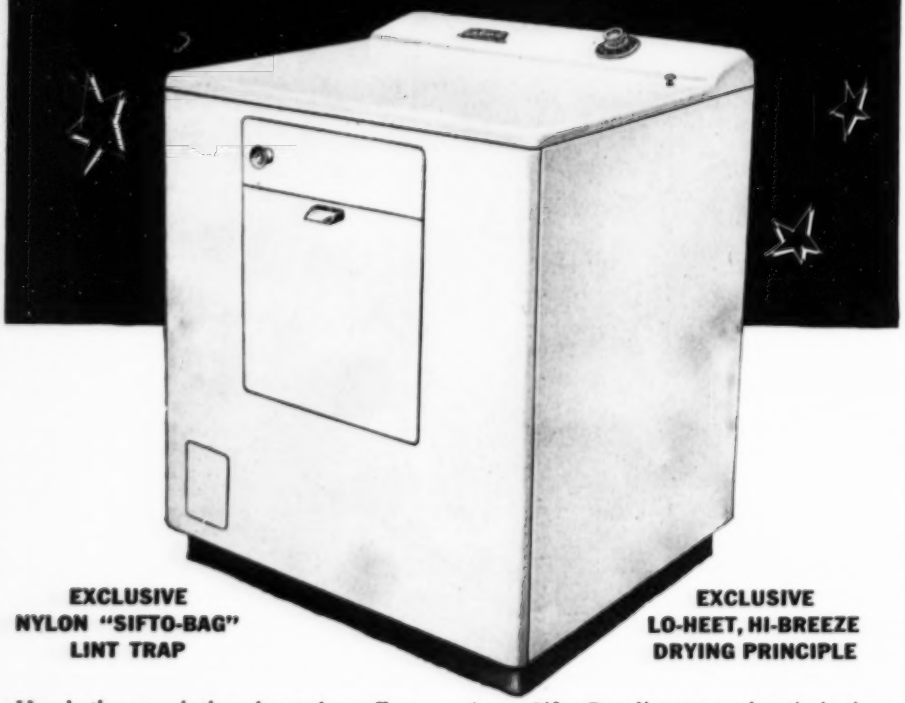
11 Magnetic Inspection Kit

A magnetic particle inspection kit from the Magnaflux Corp. has been designed especially for preventive maintenance inspection, for weld inspection, and for limited volume inspection of any magnetic part wherever surface cracks are suspected.

The Magnaflux Y-5 yoke kit comes in a metal carrying case weighing less than 30 lb. The yoke itself is the magnetizing and testing instrument. Magnaflux powder, powder bulbs, and operating instructions complete the kit. The yoke is equipped with a 100-ft cord. It draws only 6 amp from any 110-volt ac line.

Magnaflux Corp.

HERE'S CALORIC'S NEW LOW-PRICED, VALUE-PACKED AUTOMATIC GAS CLOTHES DRYER



EXCLUSIVE NYLON "SIFTO-BAG" LINT TRAP

EXCLUSIVE LO-HEET, HI-BREEZE DRYING PRINCIPLE

Here's the gas clothes dryer that offers prospects more dryer for less money than any other dryer on the market. It's built with all these outstanding features: Lo-Heet, Hi-Breeze economy drying principle, automatic operation, high level air intake, sturdy drop door, Sifto-Bag lint trap, electric ignition, Nupon finish, two ways to exhaust moisture and many other features that are making the Caloric name famous in the gas dryer field. Ask for complete details of this new, low-priced gas dryer with the high-quality features.

EXCLUSIVELY FOR GAS

CALORIC

CALORIC STOVE CORPORATION, TOPTON, PA.

RANGES • DRYERS • DISPOSERS • BUILT-IN UNITS

SEND IN THIS COUPON TO DEPT. G, CALORIC STOVE CORPORATION, TOPTON, PA.

Please send me full information on the Caloric gas dryer.

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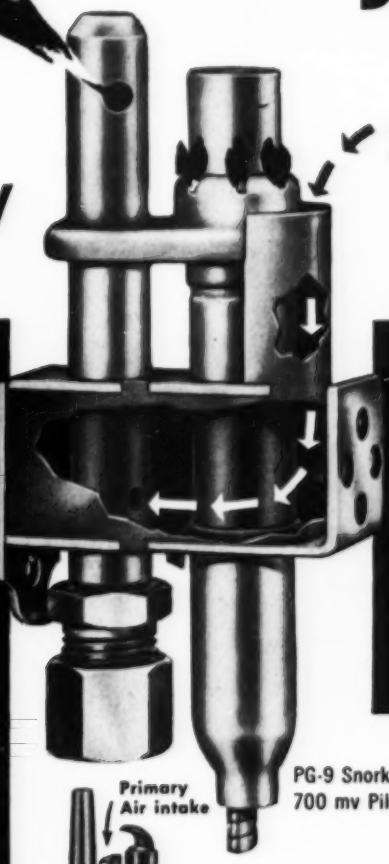
with the new

Snorkel type



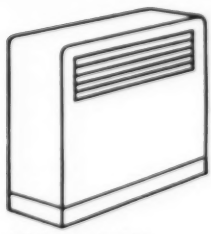
POSITIVE INCINERATOR PRINCIPLE . . .

DIRT-FREE PRIMARY AIR THROUGH SNORKEL INSURES BLUE FLAME PILOT STABILITY ON ALL GAS-FIRED APPLIANCES

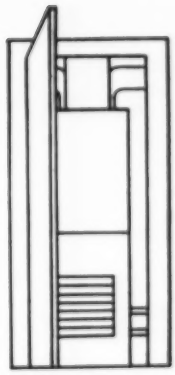
PG-9 Snorkel
700 mv Pilot Generator

26S Pilot Burner

260S Pilot Burner



CONSOLE HEATER

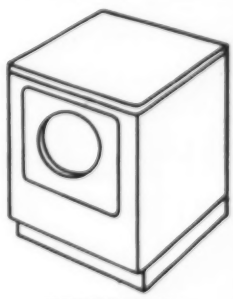


CLOSET HEATER

General Controls' Snorkel Pilot Burners and Pilot Generators incorporate proven design principle. The primary air passes under pilot flame which incinerates dirt and lint. Elimination of these foreign particles insures a crisp and stable blue flame. Primary air is mixed with gas at pilot orifice in a sealed mixing chamber which is cool, thus preventing cracking of the gas. Pilot and thermopilot flame ports are large diameter to prevent plugging. PG-9 Snorkel Pilot Generators, 260S and 26S Pilot Burners are available for all General Controls thermocouple-operated safety and self-powered control systems.

IDEAL FOR ABOVE-THE-FLOOR INSTALLATIONS

WALL HEATER



CLOTHES DRYER

GENERAL CONTROLS

PLANTS IN: GLENDALE, CALIF., BURBANK, CALIF., SKOKIE, ILL.
FACTORY BRANCHES IN 37 PRINCIPAL CITIES
SEE YOUR CLASSIFIED TELEPHONE DIRECTORY

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

Trade Literature

12 Specification Bulletins

Two new specifications bulletins are available from Schield-Bantam. (When ordering copies, use letter preceding description along with number of this notice.)

(a) Bulletin No. TSH-301 describes the Model T-35 ⅜-yd, 6-ton truck-mounted Bantam.

(b) Bulletin CSH-301 covers Bantam Model C-35 ⅜-yd crawler-mounted shovel crane.

Schield-Bantam Co.

13 Boiler Bulletin

A new line of small boilers is described in a new bulletin (AD-135) just issued by the Cleaver-Brooks Co. The four-page, two-color bulletin details construction features of the new boilers, which are available in 50- and 80-hp sizes.

Cleaver-Brooks Co.

■

14 Fitting Catalog

Emsco Manufacturing Co. has published a new bulletin covering the Emsco HP and HT small size high pressure and high temperature ball bearing swivel fittings. In addition to describing construction and applications of the fittings, the bulletin gives complete dimensions, specifications, weights, and engineering data. It is illustrated with many sectional drawings showing the various types of packing for steam, hot water, oil, L. P. gases, chemicals, etc.

Emsco Manufacturing Co.

■

15 Wire Bulletin

The Claud S. Gordon Co. has issued a new bulletin illustrating and describing its complete line of Serv-Rite thermocouple wire and thermocouple extension wire. Listed are the various sizes, metals, insulations, and prices, in addition to general application data for the various type wires.

Claud S. Gordon Co.

■

16 Conversion Catalog

E. F. Griffiths Co. has recently issued a 20-page catalog covering the company's entire line of conversion parts, special servicing tools and appliances, cylinder and appliance handling equipment, in addition to related items of gas servicing equipment.

E. F. Griffiths Co.

■

17 Tubular Folder

Its standard line of exchangers, evaporators, crystallizers and other tubular equipment for process applications is detailed in a new folder just released by The Colonial Iron Works Co. This literature illustrates and describes the company's standard exchangers employing IPS shells.

The Colonial Iron Works Co.

■

18 Crane Catalog

A new catalog, PT-1253, describes a new expanded line of push-type cranes produced by Industrial Crane & Hoist Corp. The seven-page catalog describes both the light-duty models available in five different capacities and the heavy-duty models, available in seven capacities.

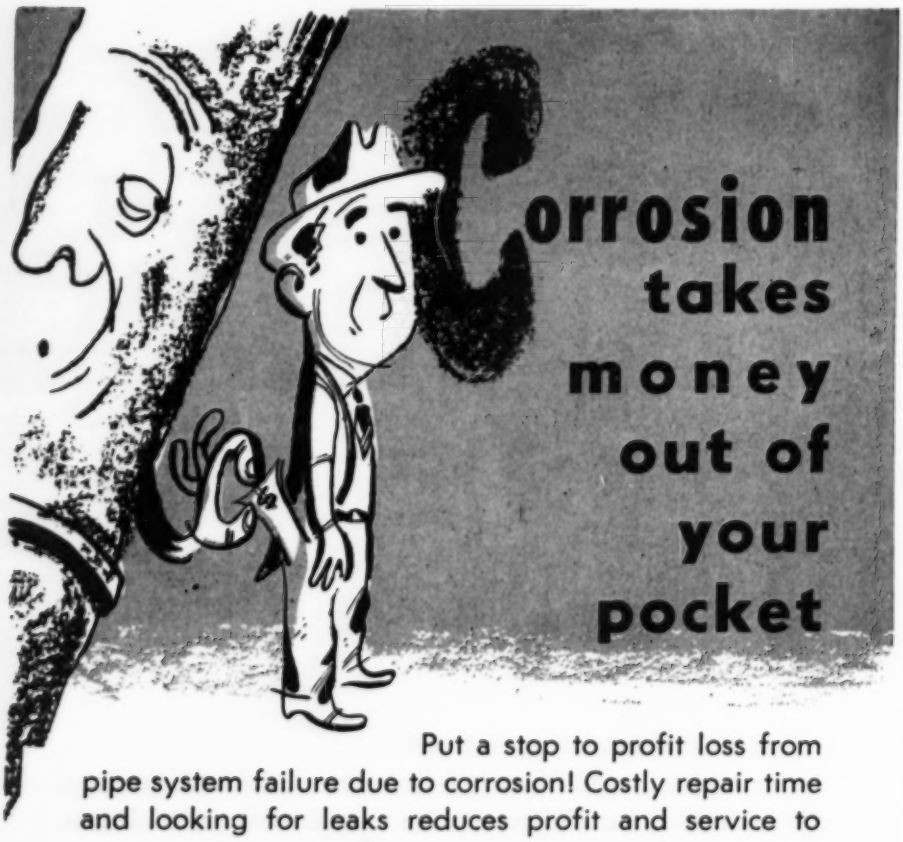
Industrial Crane & Hoist Corp.

■

19 Transmitter Sheet

Electric d/p cells transmitters are the subject of a six-page technical information sheet issued by the Foxboro Co. In addition to a list of cell specifications, pressure limits, frequency response, volumetric capacities and displacements, and cell applications, the sheet includes circuit diagrams and information and illustrations on the construction of the cells.

Foxboro Co.



Put a stop to profit loss from pipe system failure due to corrosion! Costly repair time and looking for leaks reduces profit and service to your customers. **An-Spec magnesium anodes** can prolong the life of your underground metal pipe systems by years. The most modern way to combat profit stealing corrosion . . . is by installing **An-Spec magnesium anodes** . . . your quality anodes . . .

COMPLETE ENGINEERING AND INSTALLATION SERVICE

PIPE LINE ANODE CORPORATION

25th WEST AVENUE AND SAND SPRINGS ROAD
P. O. BOX 996 ● TULSA, OKLAHOMA

Pipeline Supply Company
2230 Magnolia Street
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Crose Pipeline Equipment Co.
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Houston, Texas

ANODE SPECIALISTS
AN·SPEC

~~MILLS PLASTIC~~ BUTYRATE III does jobs metal pipe can't do. Often cuts installation costs 50% and more

Mills Plastic III pipe weighs only about 1/10 as much as metal pipe of the same diameter, yet it takes on the toughest jobs. It speeds installations amazingly because it can be cut with an ordinary hand saw, and can be quickly joined with Milex fittings and Mills Plastic III Solvent. (The simple technique is shown at right. Flange adapter unions are available to adapt from S.W.P. sizing to iron pipe thread where required. Ask your distributor for details, or write for new booklet describing all Continental Mills Plastic piping, tubing and fittings.

PETROLEUM — Here's the ideal pipe for refinery discharge, crude oil, sour crude, salt water and natural gas.

UTILITIES — Easily installed in corroded gas lines by push- or pull-through methods. Eliminates trenching and repaving.

INDUSTRY — Successful where corrosive liquids or mineral depositions damage other pipe. Smooth walls increase flow rate.

AGRICULTURE — Installing stock watering lines, sprinkler systems and irrigation lines becomes a one-man job with Mills Plastic III.

1. Wipe pipe end with Mills Plastic III Solvent.

2. Wipe inside of fitting with Mills Plastic III Thinner.

3. Insert the pipe end into the prepared slip fitting.

4. The job's done. Pipe can be handled in minutes!

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MILLS PLASTIC PIPE DIVISION
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THE NORMAC BELL JOINT CLAMP

A SIMPLE SOLUTION for one of the GAS INDUSTRY'S *most trying problems*

Solves Your Joint Repair Problems • Quick • Easy • Permanent

Installed in small pavement openings. Available in all standard sizes from 3" to 12". A simple set of tools cleans the joint, installs the clamp . . . often in only a quarter of an hour. SAVES TIME, SAVES MONEY and the repair is permanent. Designed for all conditions particularly where pavement repair costs are prohibitive. Such small opening repairs are scarcely noticeable when pavement is replaced.

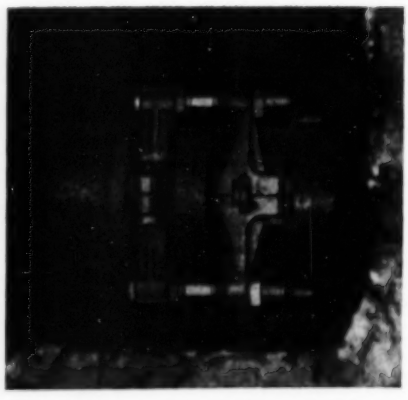
Normac Clamps can be installed in large as well as small openings.

Norton-McMurray hold definite leadership in the development of methods for installation and rehabilitation work through small openings. We welcome the opportunity to help solve a problem you may have—tell us about it.

Write for our catalog describing our complete line of

COUPLINGS . . . FITTINGS . . . SERVICE TEES and ELLS . . . SLEEVES . . . COMPRESSION-END COCKS . . . METER BARS and BRASS FITTINGS for copper pipe.

6 inch Normac Clamp being lowered into hole for installation



6 inch Normac Clamp in service after installation

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE • CHICAGO 3, ILLINOIS

Method and product covered by U. S. Patents, Nos. 2,163,261 and 2,178,286.

Thermally Thinking

Continued from page 46

might be incurred by failure to comply with Order No. 174-A."

Meantime, the FPC has postponed indefinitely the hearings which had been scheduled to resume in mid-September in the proceedings involving the application of American Louisiana Pipe Line Co. of Detroit, Mich., to build a Louisiana-to-Michigan natural gas transmission system, and applications involved with this proceedings from other companies. Off the record, the FPC wanted to set some precedent in acting on the protests of the producers, and to wait until the situation clarified itself to some extent to "escape" clauses which producers had included in their contracts with transmission companies, including companies that had signed contracts with American Louisiana but now feel that they no longer are bound to such contracts.

One thing is certain about the whole show: The FPC members, who were as surprised as the industry at the Supreme Court ruling, are even more opposed to it now than they were last spring. There may be some first-class stalling on many phases of this problem until Congress has a chance to act in January, or as soon as the new legislators get down to work. At the same time, in spite of the seeming finality of the Supreme Court ruling in the Phillips case in June, there still is a chance that the court has thought better of its action and may re-hear the whole argument. That is the $64 question right now, although there are a whole raft of smaller questions in the mind of every FPC commissioner about what is the best way to proceed.

Incidentally, the issue is being debated virtually not at all in various Congressional campaigns. No one really can say what the new Congress would do on the issue, if it were to be dominated by the Democrats, as some observers are predicting confidently.

Rate requests continue

There have been a rash of rate increases filed with the Federal Power

Commission by various pipeline companies, and it seems certain that a large part of the increases will be granted, based on cost factors.

Natural Gas Pipeline Co. of America, Chicago, has filed a proposed $10,702,000, of 27%, annual wholesale natural gas rate increase with FPC, which the company wanted to make effective Oct. 1 to affect 17 wholesale customers in Kansas, Illinois, Indiana, and Wisconsin. It would be in addition to a $7,210,000 annual increase suspended by FPC last November but in effect since Jan. 1 subject to refund.

FPC scheduled for hearing in September a suspended $694,000, or 31%, annual wholesale natural gas increase proposed by Kansas-Nebraska Natural Gas Co., Phillipsburg, Kan., which had been suspended last March, pending hearing and decision. The higher rates would affect five wholesale customers in Nebraska.

The FPC has suspended, pending hearing and decision, a proposed $10,269,000, or 42%, annual wholesale natural gas rate increase by Colorado Interstate Gas Co., Colorado Springs, which was the basis, in part, of the Natural Gas Pipeline Co. of America's projected increase.

The company had wanted to make the increase effective Sept. 1, and it was over and above a $6,508,000 increase, proposed in another proceeding, which Colorado Interstate had been collecting subject to refund, and would affect 12 wholesale customers in Colorado and Wyoming.

The commission said that the proposed higher rates "have not been shown to be justified and may be unjust, unreasonable, unduly discriminatory or preferential or otherwise unlawful."

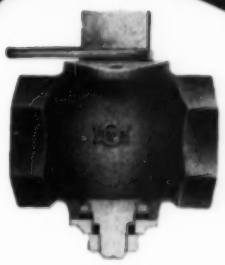
30 companies exempted under Hinshaw bill

The Federal Power Commission has acted rather promptly in issuing orders exempting companies operating entirely intrastate from the provisions of the Natural Gas Act under the so-called Hinshaw Amendment, H. R. 5976, passed last spring by Congress.

So far, some 30 companies have been declared exempt from the Natural Gas Act because of this amendment, which adds a new subsection (c) to Section 1 of the Natural Gas Act, providing that any company that purchases natural gas at or within a state boundary is exempted from provisions of the act if

IT PAYS TO BUY HAYS that are TOPS

7405
Iron Body, Galvanized, Bronze Plug Stop



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"Key-Lok" Tamper Proof Stop Lockwing—Iron Body, Bronze Plug

7500
Threadless Gas Stop Iron Body, Brass Plug

Service Line Stops—Meter Stops
Appliance Stops

Tamper Proof and Standard Patterns

Iron Body with Brass Plug
Black or Galvanized
Also All Brass Stops

Flat Head—Flat Head with Lockwing

Full Range of Sizes

Quality Assured . . .
By Precision Machining—
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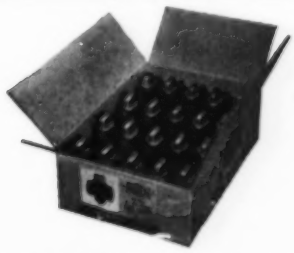
Quality Proven . . .
By Supplying the Gas Industry for Over 80 Years



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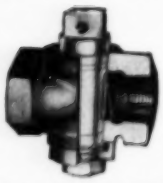
Write for literature, or ask "The Man from Hays"

GAS SERVICE PRODUCTS
HAYS MANUFACTURING CO.
ERIE, PA.

"Better get a quote from ECLIPSE"

. . . FOR FAST SERVICE ON GAS COCKS

STANDARD—Eclipse iron body brass core construction serves better, longer. Individually tested at 125 lbs. and guaranteed as to gas-tightness, accuracy and alignment of tappings.



"RETAINED KEY" — Tamperproof construction . . . offers in addition the assurance that key will not be blown from or pulled out of the body even though the lock nut is removed or the tail piece snapped off.

Both types available for immediate, partial shipment, in flat head or lock wing style, black or galvanized finish.

. . . COMPLETE STOCKS OF RIGID METER BARS

STANDARD UNION, with standard type, gasket or ground joint union. Simplify and speed setting, give maximum protection to the meter. ALSO AVAILABLE WITH INSULATED UNION.

SLEEVE UNION, with threaded, one-piece sleeve union connections . . . no gasket required. Soundness and accuracy guaranteed.

COMPRESSION TYPE has threadless connection for "stab fit" of pipe. Gives maximum protection, plus new speed, flexibility and low cost meter settings.

All types available with or without integral gas cock (standard or "retained key") in wide range of sizes and styles.

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ECLIPSE FUEL ENGINEERING CO. OF CANADA, LTD., TORONTO, ONTARIO

GAS COCKS — Eclipse — METER BARS

Write today for new Eclipse Rigid Meter Bar Bulletin, P-1; Gas Cock Bulletin, P-12.

Eclipse Fuel Engineering Co., 1109 Buchanan St., Rockford, Illinois

( ) Please send new Meter Bar Bulletin P-1
( ) Please send Gas Cock Bulletin P-12
( ) Please send samples for inspection and test.

Firm Name_____
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all of the gas so purchased is consumed within that state, and the rates, service and facilities are regulated by a state commission.

The commission amended its rules recently to prescribe the procedure to be followed by natural gas companies in making application to qualify for exemption under the Hinshaw Amendment. The procedures have been criticized by company attorneys and some associations, who believe that exemption should be automatic, but no one seems to be making much of an issue of it. The thinking is that the bureaucrats couldn't be happy unless they handled some paper somewhere along the line. Probably makes them feel more important.

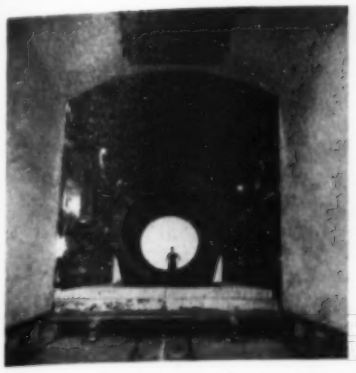
West Coast plans for consumer demand

Three West Coast companies plan to boost their natural gas purchases by almost 20% over the next three years in order to meet consumer demand, according to word reaching here.

They are Pacific Gas & Electric Co., Southern California Gas Co. and Southern Counties Gas Co., who have notified El Paso Natural Gas Co. of intentions to increase their purchases of gas by about 200 MMcf daily. Transmission facilities, subject to FPC approval, will be expanded in order to make the additional supplies possible.

Pacific Coast utilities estimate that they will require delivery of another 10 MMcf after 1957. Deliverability of this gas by El Paso will be contingent upon contracts with producers, which is complicated also by the Phillips decision.

FPC meanwhile has given Panhandle Eastern Pipe Line Co. the green light on a $22.8 million expansion project to increase the gas supply from the Southwest to the midwestern states. A recent survey showed that customers of Panhandle Eastern in Illinois, Indiana, Michigan, Ohio, and Missouri can use an additional daily supply of 200 MMcf of natural gas. Expansion of facilities authorized by FPC is only one phase of a $66.7 million construction program designed to boost Panhandle Eastern's peak-day capacity by 50%.



Looking into Westinghouse Electric's new car-type heat treating furnace for stress relieving of large weldments.

Westinghouse builds mammoth furnace

A CAR-TYPE heat treating furnace has been built by the Westinghouse Electric Corp. and installed at its East Pittsburgh, Pa., works, where it will be used for the stress relieving of large weldments.

With a fully usable charge space 30 ft long, 18 ft wide and 16 ft high, single or multiple parts weighing up to 100 tons may be treated at one time. The furnace was designed for a maximum operating temperature of 1600° F, but stress relieving will be performed at approximately 1175° F.

Near the top and behind the furnace chamber itself, a refractory-lined combustion chamber is mounted, into which four burners with a rating of 7 million Btu/hr will fire. The air passing through the combustion chamber is heated by the burning of gas, and enters the furnace from the rear through ducts suspended from the ceiling. This duct work distributes the heated air through various side openings as it travels toward the front, assuring uniform heating throughout the charge space.

To complete the cycle, air is drawn out of the furnace through two recirculating blowers having a total circulating rate of 120 Mcf per minute. Duct work then directs the air flow upward to the combustion chamber and thence into the furnace chamber again. Each circulating fan is powered by a 50-hp motor. This method of firing and the use of internal duct work prevent hot spots within the charge space and eliminate the need for overhead space above the furnace roof.

A program control is provided to automatically regulate the cycle of heat-up, soak, and cool-back to handling temperatures.

How a Sherman Power Digger Does More Work in Less Time with No Standby Equipment

Nearly every department in the city of Hopkins, Minnesota, finds a use for this versatile Sherman Power Digger.

The Water Department uses the machine when cutting off discontinued service lines at the main. They dig a hole in the street (usually blacktop) 3′ wide by 6′ long by 8′ deep. The hole must be plumbwalled for minimum replacement of paving. This operation used to tie up a truck all day, an air compressor half a day, and two men with hand tools, a full day.

Using a Sherman Power Digger, they now do *three* such jobs in one day, with only one man on the digger, no truck, and no compressor, except for concrete pavement. The job goes faster because they can dig the hole, shut off the line, and backfill before the walls begin to cave. Local soil conditions formerly required cribbing many of these excavations.

If *your* work involves the construction or maintenance of underground facilities, you will profit with a Sherman Power Digger. It's compact, fast, and flexible, with low initial cost and amazing economy of operation. Write today for full details, without obligation. Ask for Bulletin No. J16.

Designed, Engineered and Manufactured Jointly by
SHERMAN PRODUCTS, Inc.
Royal Oak, Michigan
WAIN-ROY CORPORATION
Hubbardston, Mass.

Patent No. 2,303,852
Other patents pending

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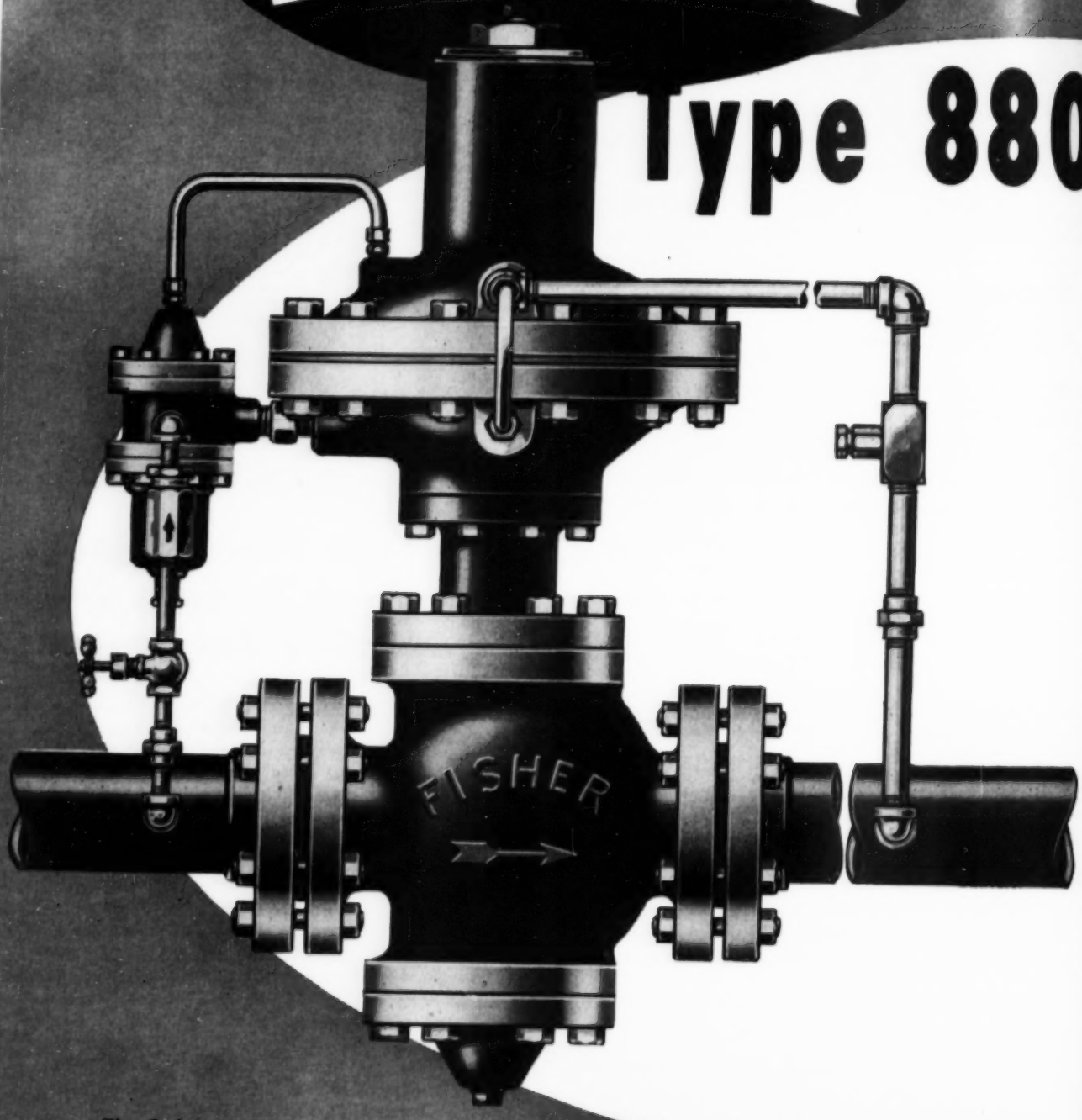
Sherman
PRODUCTS, INC.
ROYAL OAK, MICHIGAN

FISHER®

Type 880



The Fisher "880" employs a well proven method of pilot loading and pressure balancing a large spring loaded main diaphragm. Insures positive positioning of main valve in accordance with flow changes and assures accurate control of the reduced pressure in a stable and non-pulsating manner.

FISHER GOVERNOR COMPANY

FISHER® LEADS THE INDUSTRY IN RESEARCH FOR

HIGH PRESSURE STATION REGULATOR

NO BLEED OF PILOT LOADING GAS TO ATMOSPHERE

Features

1. **Pilot loading pressure balanced principle of operation develops fast, accurate, stable control.**
2. **Up to 2" inner valve travel for extreme high capacity requirements.**
3. **High rangeability with inlet pressures up to 600 psi and outlet pressures from 1 to 250 psi.**
4. **Bodies available in high-tensile iron or cast steel in sizes 2" to 10".**
5. **Unit available with top and bottom guided inner valve for severe pressure conditions, or composition "O" ring disc inner valve for absolute tight shut-off.**
6. **Spring closed construction insures positive inner valve action under all conditions.**

Performance

The Fisher Type 880 is an ideal town and border station regulator that promotes *precise* and *stable* metering.

It will be found of great value for *high pressure* loop lines and *high pressure* distribution stations where dependability is absolutely essential. Bleeds *no* gas to the atmosphere, can be installed in pits or other locations subject to flooding by venting breather opening of pilot diaphragm to a level above flood stage.

Loading Pilot

Sturdy compact Type 62 loading pilot is the same that has been used for years on the famous Fisher King Booster.

WRITE FOR BULLETIN — P880

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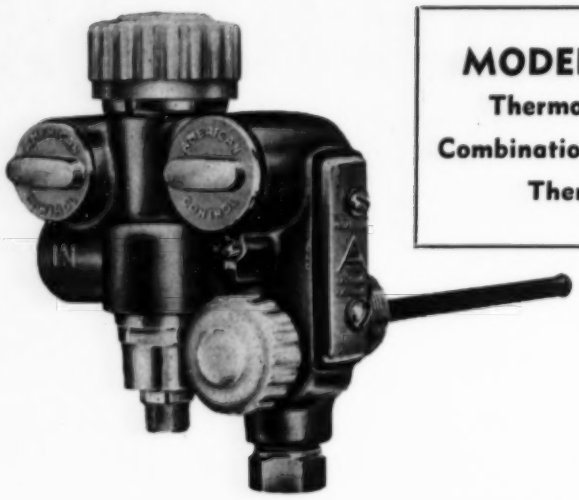
Since 1880

BETTER GAS PRESSURE CONTROL

Meet American Control Corp.'s *Newest Member*



MODEL AC-100
Thermo-Magnetic
Combination Snap-Action
Thermostat

- The water heater thermostat that has everything!
- Thermo-magnetic gas flow valve.
- 100% pilot and main gas closing.
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- Safe lighting main gas valve position.
- Adequate means for built-in pilot filter.
- High capacity gas flow channels.
- Snap-action high valve lift.
- Finger tip dial temperature indicator.
- Balanced beauty of design.
- Practical for both concealed and exposed application.

AMERICAN CONTROL CORPORATION
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Manufacturers of Thermostats and Safety Pilot Controls

install underground pipe without breaking ground surface

for water, gas and sewer lines

Bores up to 6" in diameter and 150 feet in length. Accurate within 1" of target area.

Speed of 1½ f.p.m. 1000 feet per gallon of gas. Automatic warning of underground hazards.

Saves thousands of dollars per year. Buy it out of these savings.

Immediate delivery. Send for details now.

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P.O. Box 1100 Santa Monica, Calif.

CALENDAR

October

7-8..California Natural Gasoline Assn. Annual Fall Meeting. Ambassador Hotel, Los Angeles.

8..NEGA Commercial Group, CHI Division — Hampshire House, Boston.

10-13..Controllers Institute of America — Edgewater Beach Hotel, Chicago.

11-13..AGA Annual Convention — Atlantic City, N. J.

15..NEGA Heating Group, CHI Division—Hampshire House, Boston.

18-22..National Safety Council — Chicago.

21..NEGA Residential Sales Division — Boston Consolidated Auditorium, Boston.

22..NEGA Residential Sales Division — CL&P Auditorium, Berlin, Conn.

29..NGAA Southern Regional Meeting—Blackstone Hotel, Tyler, Texas.

November

1-5..National Metal Exposition—Chicago, Ill.

4..NEGA Operating Division — Hotel Statler, Hartford, Conn.

5..SGA Field Production of Natural Gas Conference—Herring Hotel, Amarillo.

8-9..Gas Measurement Institute—Legion Hall, Liberal, Kan.

8-11..American Petroleum Institute—Conrad Hilton Hotel, Chicago.

12..SGA Residential Sales Conference—DeSoto Hotel, Savannah, Ga.

15-17..American Standards Association—Hotel Roosevelt, New York.

17..NEGA Safety Conference — Hotel Statler, Boston.

17-19..Southeastern Gas Association —Sir Walter Hotel, Raleigh, N. C.

17-19..Wisconsin Utilities Association, Electric & Gas Section, Technical & Sales & Service Divisions — Hotel Schroeder, Milwaukee.

19..SGA Residential Sales Conference — Marion Hotel, Little Rock.

28-3..American Society of Mechanical Engineers — Statler Hotel, New York.

December

3..Panhandle Plains Regional

Meeting NGAA — Herring Hotel, Amarillo, Texas.

3 NEGA Gas Utility Sales Managers Conference — Hampshire House, Boston.

6-7 SGA Advisory Council and Management Conference — Point Clear, Ala.

7 NEGA Appliance Servicing Conference — Hotel Statler, Boston.

8-10 Eastern Computers Conference (AIEE, IRE, ACM) — Bellevue-Stratford Hotel, Philadelphia.

1955

January

17-19 7th Annual Convention, Pipe Line Contractors Association —Statler Hotel, Los Angeles.

18 NEGA Operating Division— Hotel Statler, Boston.

February

13-15 24th Annual Mid-Winter Conference of Public Utility Buyers' Group, National Association of Purchasing Agents — Shamrock Hotel, Houston.

March

7-9 Mid-West Gas Association— St. Paul Hotel, St. Paul, Minn.

7-11 National Association of Corrosion Engineers — Palmer House, Chicago.

24-25 AGA Gas Supply, Transmission & Storage Conference— William Penn Hotel, Pittsburgh.

24-25 NEGA Annual Meeting — Hotel Statler, Boston.

24-25 Oklahoma Utilities Association Convention — Mayo Hotel, Tulsa.

April

12-14 AGA Sales Conference on Industrial & Commercial Gas —Hotel Statler, Boston.

12-15 AGA Distribution, Motor Vehicles & Corrosion Conference — Netherland Plaza, Cincinnati.

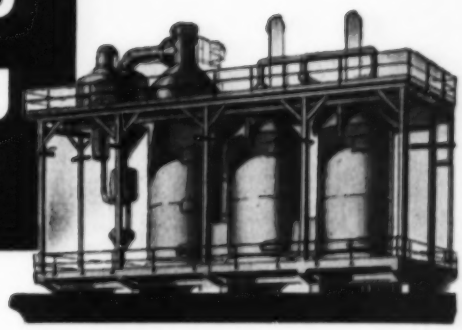
19-21 Southwestern Gas Measurement Short Course—University of Oklahoma, Norman.

20-22 Indiana Gas Association Annual Meeting — French Lick Springs Hotel, French Lick, Ind.

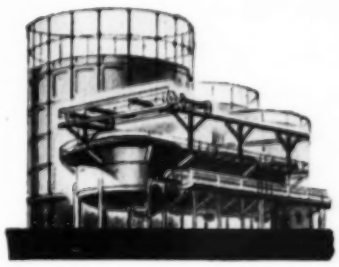
25-27 National Conference of Electric and Gas Utility Accountants — Conrad Hilton Hotel, Chicago.

25-27 Mid-West Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.

GASMACO pioneering since 1902

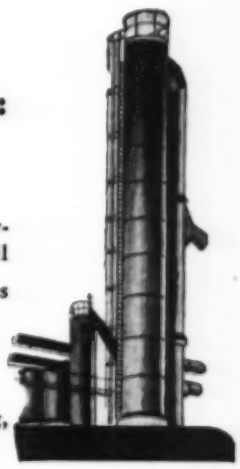


means continuous service and profit to you

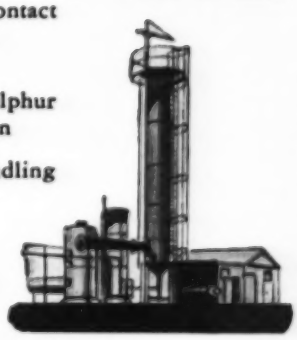


GASMACO has pioneered at least nine major contributions to the gas industry since 1902 comprising new services, new processes, and new equipment.

look at the versatility which GASMACO processes and equipment provide today:



- Low Cost Conversion of Existing Gas Sets to Hi-Btu Oil Gas
- Other Oil Gas Methods for Standby and Peak Shaving, Efficiently Designed for Light or Heavy Oil
- Latest Designs for New and Complete Oil Gas Plants — Base Load or Peak Shaving
- Continuous Gas Generation, Utilizing LPG or Gasoline Feeds
- Water Gas Apparatus, Solid Fuel Bed Reforming, Auxiliary Gas Plant Fixtures
- Gas Cooling — Condensers and Direct Contact Scrubbers — Effluent Decantation and Heat Exchange Systems
- Purification Equipment for Removal of Sulphur Compounds — Low or High Pressure Design
- Oil Scrubbing, Light Oil Recovery, Tar Handling and Other By-Product Recovery
- Auxiliary LPG Systems
- Liquefaction, Storage and Regasification of Natural Gas



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Designers • Fabricators • Erectors
Gas Plant Equipment and Industrial Furnaces
THE GAS MACHINERY CO. (Canada), Ltd.
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ARCCO
ARCCO ... NOW
OFFERS
8 DAY
CHARTS
and
ROCKWELL CHART DRIVES
EIGHT-DAY ARCCO CHARTS are now available for use on practically all Rockwell-Emco, Foxboro and Westcott orifice meters. Eight day charts for other instruments soon available.
With this NEW Chart Drive 11 rotation speeds are possible. Turrets are available for 2, 3, 4, 6, 8 and 12 hours, also for 2, 3, 7, and 8 day rotation. Standard hub gives 24 hour rotation.
ROCKWELL CHART DRIVES are ruggedly built and are sealed for years of trouble-free service. The drives are adaptable to practically every type of instrument using circular charts. The price is $13.75 each. Turrets are $4.25 each F.O.B. Los Angeles, Calif., or Tulsa, Oklahoma.
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3113 E. 11th St. • Los Angeles 23, Calif.
SEND FOR DRIVE AND CHART BULLETIN
SEND FOR BULLETIN NO. 104-R

Research unearths promising devices for air conditioning

WITHIN the past few years the demand for residential air conditioning during the summer season has fostered the growth of a new industry, which men in the gas business are eyeing with particular interest. Current and predicted trends based to a large extent on research now being conducted point to the steadily increasing use of gas as a source of energy for cooling homes in the summer as well as for winter heating.

Currently, the greatest demand is for window air conditioners. However, acceptance of year-around units for both heating and cooling is rapidly spreading. Approximately 50,000 such units were produced and sold in 1953, and it is predicted that 120,000 will be turned out in 1954. Hobart C. Ramsey, president of the Worthington Corp., considers the annual production of 700,000 year-around units by 1958 not out of the question, and perhaps 1 million by the year 1963. This figure signifies that $15,000 houses, as well as more expensive buildings, will be utilizing such installations.

At present the electric motor-driven Freon compression air conditioner substantially dominates the market, but the possibilities for gas-burning equipment are very promising. The continuing strong trend toward gas heating for the American home gives the gas industry a substantial initial advantage in the marketing of gas air conditioning equipment. This is pointed up by the fact that various manufacturers of Freon-compression conditioners have recently attempted to combine their electric powered units with gas-burning equipment. The advantages of having not only gas-fired heating equipment but also a gas-operated refrigeration unit in year-around residential air-conditioning systems are obvious.

Certain factors should be considered by the home owner during selection of his air conditioning equipment: the price differential existing in many parts of the country favors gas over electricity as the less expensive source of energy; in some sections of the country the extensive use of electric air conditioners could conceivably cause an electric-power shortage whereas the availability of natural gas creates no such problem.

The American Gas Association is acutely aware of the importance of the air conditioning trend to the gas industry. With full realization of the high stakes that are involved, it is pursuing the development of gas air conditioning

MECHANICAL JOINT ACCESSORIES

Malleable Iron Follower Glands
Strong — Corrosion Resistant — Light Weight — Sizes 2" thru 12"
High Strength Cast Iron Tee Head Bolts and Nuts
Write for Information and Prices to:
CADILLAC CAST PARTS CO.
Subsidiary of
Cadillac Malleable Iron Co.
Cadillac, Michigan

equipment by, first, offering its cooperation and research facilities to those companies presently in the field and, second, by conducting an independent survey of methods of cooling with gas. The latter program has been assigned to independent organizations.

These groups, along with reviewing presently known methods of using gas for the cooling of air, are studying various systems heretofore impractical but which might, upon the application of the latest techniques of design, manufacturing processes, chemistry, and metallurgy, prove highly feasible. Extensive investigations are being conducted on the presently commercially available absorption type of system, characterized by the "silent flame" and "no moving parts."

It is hoped that this constructive review of the currently practicable system will result in one which is more competitive with electric-powered air conditioning equipment. Operational improvements sought include greater efficiency, lower initial expense, less maintenance required, and a reduction in the amount of water necessary for the absorption system. This last item is becoming a serious concern due to water shortage and high water costs frequently encountered.

Some other less popularized and more novel systems under investigation may be exemplified by units utilizing a gas-burning internal combustion engine and the so-called Phillips air engine, both of which are capable of driving a Freon compressor. The former would have most of the desirable features of the present electric system without reliance upon the relatively expensive electrical energy. Several large manufacturers of this type of engine express confidence in its suitability, but numerous technical improvements remain to be made in the realms of dependability, safety, quietness of operation, and automatic starting. There is, nevertheless, little question that it offers a possible means of air conditioning with gas.

The Phillips air engine, recently developed in Europe, also holds promise. The energy source consists of a gas flame externally applied to the cylinder head of a unique engine, which, by means of a novel arrangement of pistons, regenerators, and heat transfer surfaces, converts heat into rotary power. Present indications, including evaluations being made at the Battelle laboratories, offer strong evidence that this engine, with refinements, will be well suited for air conditioning equipment. Major advantages claimed are quiet operation and high efficiency.

—R. J. McCrory, Battelle Memorial Institute. Presented at the AGA research and utilization conference held in June.

machine-digging in

City Congestion Above and Below Ground

THE MINNEAPOLIS GAS COMPANY recently installed gas mains in such major downtown thoroughfares as Fifth St., Sixth St., Nicollet Ave., and Second Ave. S., in connection with one of the city's biggest repaving programs in years. Shown here are crews of Minnesota Williams Company putting in one of these lines under Fifth St. between Nicollet and Hennepin Aves.

The compactness of the CLEVELAND Trencher and its maximum operator visibility and control—inherent in all CLEVELANDS—made machine-digging practical on this job despite traffic problems and numerous underground obstructions. Advantages like these, enabling CLEVELAND owners to dig *more trench, in more places at less cost,* have earned outstanding preference for CLEVELANDS—among contractors, utilities and municipalities, alike.

Write for Full Line CLEVELAND Bulletin or See Your Local CLEVELAND Distributor

THE CLEVELAND TRENCHER COMPANY
20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

CLEVELAND

Aerial view of Abilene, Texas

Lone Star Gas promotes action demonstration in Abilene!

Action demonstration is the big promotional effort of the Lone Star Gas Company in Abilene, Texas, this year. Incorporating the Gas Industry Development Program's 15 points, the company began booming this project the first of the year.

Then a special 60-day promotional program began August 1 to strengthen the drive.

Stressing the upgrading concept, Lone Star began by setting the pattern with its own sales organization. As the promotion moved into full swing, the efforts of manufacturers' distributors and dealers were brought into play . . . as well as architects and builders.

Another phase of the Lone Star promotion is a training program for dealers' sales and service organizations, and a plan for special financing terms made available to all participating dealers.

To top off this program, Lone Star is supporting the dealer promotions with extensive advertising in newspapers, radio, television, billboards, and direct mail!

Lone Star Gas sponsors upgrading promotion despite market saturation!

Chester May, Senior Vice-President of Lone Star Gas

Chester May, Senior Vice-President of progressive Lone Star Gas says, "In Abilene, Texas, 99% of the homes are heated with gas. In 1944, this market position would have been considered satisfactory. *But not in 1954!*

"Dominating the market is no protection from inroads by the competition . . . upgrading is our only protection.

"Today we have virtually no competition. Despite this, a promotion to upgrade heating equipment is one of the most important phases of our *Action Demonstration.*"

Popular Honeywell controls help boost Lone Star upgrading effort

The Honeywell Round (T586) Thermostat is the best performing thermostat available for self-powered systems. It has an enclosed mercury switch . . . a clip-on heater element for timing burner on-off periods . . . and an improved design—the attractive cover can be painted to blend with any color scheme.

New Honeywell Y400 Powerpile Package can be used with *all* gases. It features a blue flame pilot that uses no primary air, and gives 40% more power with just *half* as much gas. With this simple, *self-powered* control system and its wide range of thermostats—Lone Star can please *all* its customers!

For illustrated literature and application data about these or any other dependable Honeywell Controls, call your local Honeywell office. Or, write to Honeywell, Dept. GS-10-208, Minneapolis 8, Minnesota.

MINNEAPOLIS **Honeywell**

First in Controls

112 offices across the nation

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NEW PIPEWRAP FOLDER

Here in brief factual form are the things you need to know about Glass Fibers'

BLUE FLAG *Glass Fiber Reinforcing Pipe Wrap*
DURAMAT *Outer Wrap*
DURAMESH *Pipeline Fabric*

Because of its unusual resistance to the deteriorating effects of soil chemicals, the importance of the special-formula insert glass, which was developed by Glass Fibers' technicians for exclusive use in pipewrap, is explained.

You will also find basic product information, application data for both "yard applied" and "over the ditch" operations, penetration tests, important in corrosion protection. Fill out and mail the coupon below.

GLASS FIBERS INC.
1810 Madison Avenue . Toledo 2, Ohio

Gentlemen: Please send me your new Pipe Wrap Folder.

NAME _____
ADDRESS _____
POSITION _____
CITY _____
STATE _____

People

Promotions

Two new vice presidents and three new assistant vice presidents have been named by Robertshaw-Fulton Controls Co., Greensburg, Pa. WOODFORD D. MILLER, manager of the Robertshaw Thermostat division, and WILBUR JACKSON, works manager at the Grayson Controls division, are now vice presidents. The assistant vice presidents are: FRANK H. POST, who also becomes sales manager, Cooking Appliance Controls division; ALTON W. BECK, who also becomes sales manager of the Heating Appliance Controls division; and JOHN A. ROBERTSHAW JR., manager of foreign operations.

W. D. Miller **W. Jackson**
Robertshaw-Fulton

FRANK A. ROTHWELL, an industrial sales representative for United Gas Pipe Line Co., has been transferred to the firm's San Antonio district. He succeeds W. M. STEPHENS, who was recently promoted to Houston division sales manager for United Gas Corp.

WILLIAM F. JOHNSON has been appointed sales promotion manager for the Hardwick Stove Co., Cleveland, Tenn.

STAN ANDREWS, regional manager for the Dallas area of General Controls Co., has been promoted to manager of the Appliance Controls division in Glendale, Calif.

Lone Star Gas Co., Dallas, has elected LOUIS G. JAMES as comptroller, succeeding L. L. DYER, who has retired. The company has also appointed ELSTER A. SMITH to the newly created post of assistant manager of the gas supply department.

Peoples Natural Gas Co., Pittsburgh, has appointed GEORGE W. HARTUNG to the post of assistant treasurer. He is succeeded as head of the payroll department by RAYMOND P. FROELICH.

ERNEST C. HATHAWAY, formerly general commercial manager, has been made director of the newly formed department of industrial development by the Central Vermont Public Service Corp., Rutland. The following changes have also been made: NAT TYLER becomes general sales manager;

THERE'S NO SEAL LIKE RECTORSEAL

— that's why gas companies are switching to this positive, economical, leak-proof thread sealing compound.

If you haven't tried Rectorseal, get a can from your supply house today. Check its sealing quality, consistency, cleanliness, insolubility, smoothness, economy, and other advantages with thread seals you are now using.

Rectorseal holds even the most potent odorants. It never hardens, crumbles, cracks or gets brittle.

If your supply house can't supply you, send us his name and address and we will send YOU a generous FREE SAMPLE.

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MAKING THE GAS INDUSTRY SAFER

WARRENGAS
A LIQUEFIED PETROLEUM GAS OF HIGHEST QUALITY

WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA

SALES OFFICES:
FORT WORTH, TEXAS
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MADISON, WISCONSIN
MIDLAND, TEXAS
MOBILE, ALABAMA
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA
COLUMBIA, SOUTH CAROLINA

PATRICK H. MANGAN, assistant general sales manager; and FREDERICK D. CHURCHILL, executive assistant for merchandise sales.

DR. CARL T. ASHBY, chief engineer for refrigerators and freezers at Servel Inc., Evansville, Ind., has been appointed to the same post for all-year air conditioning. EDWIN C. GEISHERT, assistant chief engineer for room air conditioners, will head a separate department for room air conditioners and compression type air conditioners.

JOHN P. RICHMOND, formerly comptroller, has been elected vice president in charge of finance of ACF Industries Inc., New York, succeeding JAMES F. CLARK, who was recently elected president. PAUL M. ANDERSON has been appointed assistant vice president, and WALTER J. CONATY succeeds Mr. Richmond as comptroller.

WILLIAM J. MURPHY is now fuel agent for Consolidated Edison Co. of New York, succeeding ROBERT E. DENNIS, who has retired.

ALAN R. BAILEY, vice president in charge of operations of Coast Counties Gas & Electric Co. before its merger with Pacific Gas & Electric Co., has been appointed assistant vice president and general manager of PG&E.

A. R. Bailey
PG&E

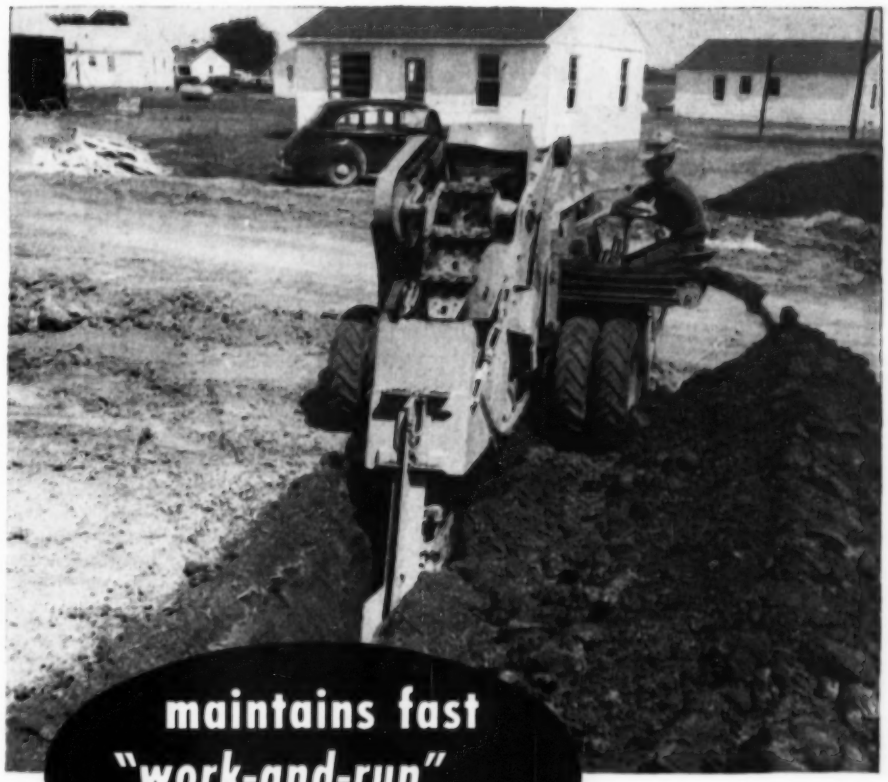
D. C. Menzies
Servel

DUNCAN CAMERON MENZIES has been elected president, general manager and a director of Servel Inc., succeeding W. PAUL JONES, who becomes vice chairman of the board.

GEORGE MAVES has been promoted to the post of manager of Minneapolis-Honeywell Regulator Co.'s Pacific region, succeeding GAVIN S. YOUNKIN, who was recently named general sales manager for the company. R. W. FORSTER, who has been manager of the Buffalo, N. Y. sales office, succeeds Mr. Maves as Boston manager.

HUGH L. WATHEN has been elected vice president in charge of sales and public relations of the South Jersey Gas Co., Atlantic City.

C. I. WALL, formerly vice president, has been named executive vice president of Pio-



maintains fast "work-and-run" schedules

CHECK THESE ADVANTAGES:

- ☐ 12.6 mph mobility on rubber
- ☐ automotive steering
- ☐ truck-type hydraulic brakes
- ☐ digs up to 14½ ft. per min.
- ☐ 8 to 16 in. wide, 5 ft. deep
- ☐ positive down-crowd boom
- ☐ high-carbon cast-steel buckets
- ☐ easy-insert "Tap-In" teeth
- ☐ shiftable, reversible conveyor
- ☐ 43.6 h.p. gas engine
- ☐ 6-ft. backfill blade (optional)

Parsons rubber-tired 88 Trenchmobile is the low-cost answer on widely-scattered, small-yardage trenching jobs, where it costs more to move big equipment in and out than it does to move the dirt. This mobile trencher drives cross-town at 12.6 m.p.h. . . . digs house-to-street service connections at speeds up to 14½ feet per minute... drives on to next job without delay.

With its 8 to 16-inch cutting widths, and maximum depths of 5 feet, Trenchmobile is also big enough for main line excavations. It saves a lot of costly hand clean-up, too . . . undercuts sidewalks, curbs, gutters, mains . . . makes vertical set-ins flush with foundations . . . backfills its own trench (blade optional). Get the complete story from your Parsons distributor, or write us.

Want more facts? Write PARSONS CO., Newton, Iowa for bulletin on 43.6 HP 88 Trenchmobile

NAME _____
TITLE _____
COMPANY _____
DIVISION _____
STREET _____
CITY, STATE _____

P466 GAS

PARSONS Trenchmobile
(Koehring Subsidiary)

More for your money!

DAVEY ··· TODAY'S BEST COMPRESSOR AND TOOL INVESTMENTS!

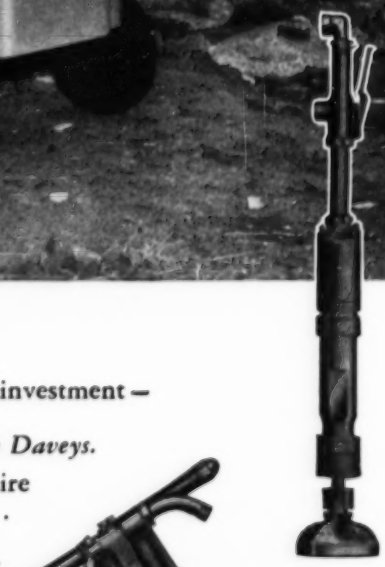
Davey Model 210 Super Chief

From the standpoint of original investment — and reduced operating costs — *you get more for your money with Daveys.*

DAVEY MULTI-PORT VALVES require less engine power and less fuel . . . never carbon or foul . . . assure constant full volume of air, keep tools operating at top efficiency. And, they're only one of many features of today's fine Davey lightweight, heavy-duty compressors in 60-125-160-210-315-500-600 c.f.m. sizes.

DAVEY AIR TOOLS are designed to meet today's needs! They're streamlined . . . perfectly balanced . . . easier to handle . . . hard-hitting with extra high penetrating power. And, because they offer maximum parts interchangeability, they greatly reduce maintenance and repair expense.

For complete details, see your nearest Davey distributor!



Davey Backfill Tampers, 35 and 45 lb. sizes

Davey Rock Drills, 4 sizes 28 to 58 lbs.

Davey Paving Breakers 4 sizes—35 to 90 lbs.

DAVEY

pioneers of "air-cooled air"

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DAVEY COMPRESSOR CO.
KENT, OHIO

neer Natural Gas Co., Lubbock, Texas. He served as president of West Texas Gas Co. before the consolidation of the companies that now make up Pioneer Natural.

JAMES F. POLLARD, manager of the commercial department of Pacific Gas & Electric Co., San Francisco, has retired. He has been succeeded by R. W. JOYCE. The company also announces the appointment of RICHARD L. HAYDEN as manager of customer and community services.

E. A. BARTOLINA has been named manager of the manufacturing division of the Moorlane Co., Tulsa., succeeding REX BIRCKET, who is no longer with the firm.

E. A. Bartolina
Moorlane

W. T. Rasch
Rasch Mfg.

WILLIAM T. RASCH, president of the Rasch Manufacturing Corp., Kansas City, has retired after many years in the gas industry. In addition to being an active member of the AGA, Mr. Rasch was the first president of the Gas Appliance Manufacturers Association. He began his career with the Consolidated Gas Co. of New York, later serving as president of the American Gas Products Corp. In 1940 he became president of Security Manufacturing Co., predecessor to Rasch Manufacturing Corp. LEE W. RASCH has succeeded him as president of Rasch Manufacturing.

G. E. HITZ, executive assistant to the vice president in charge of operations of Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y., has retired after more than 40 years with the company.

HENRY A. HUBBARD will cover the Dallas area for the American Meter Co. as sales representative.

STREUBY L. DRUMM recently resigned as vice president and head of the industrial engineering and utilization department of New Orleans (La.) Public Service Inc. to accept the position of executive vice president of the West Penn Power Co., Pittsburgh. Before joining Public Service, Mr. Drumm had been associated with Phoenix Utility Co.

Five district managers of Oklahoma Natural Gas Co. have been promoted to the position of district vice presidents. They are: A. F. HOLMES, Enid; E. C. MCANINCH, Ardmore; C. H. RICH, Shawnee; P. V.

ROOT, Muskogee; and T. H. STERLING, Oklahoma City.

J. H. LAMBDIN has been named to fill the new position of operating superintendent in the general offices of the Mississippi Valley Gas Co., Jackson. C. C. TAYLOR, formerly district manager at Greenville, succeeds him as Jackson manager.

RALPH F. HORNBACH, who has been director of purchasing for the Geo. D. Roper Corp., Rockford, Ill., has been named general manager of the newly created special products division.

JOHN F. SISSON has joined the legal staff of the Ohio Fuel Gas Co., Columbus.

Deaths

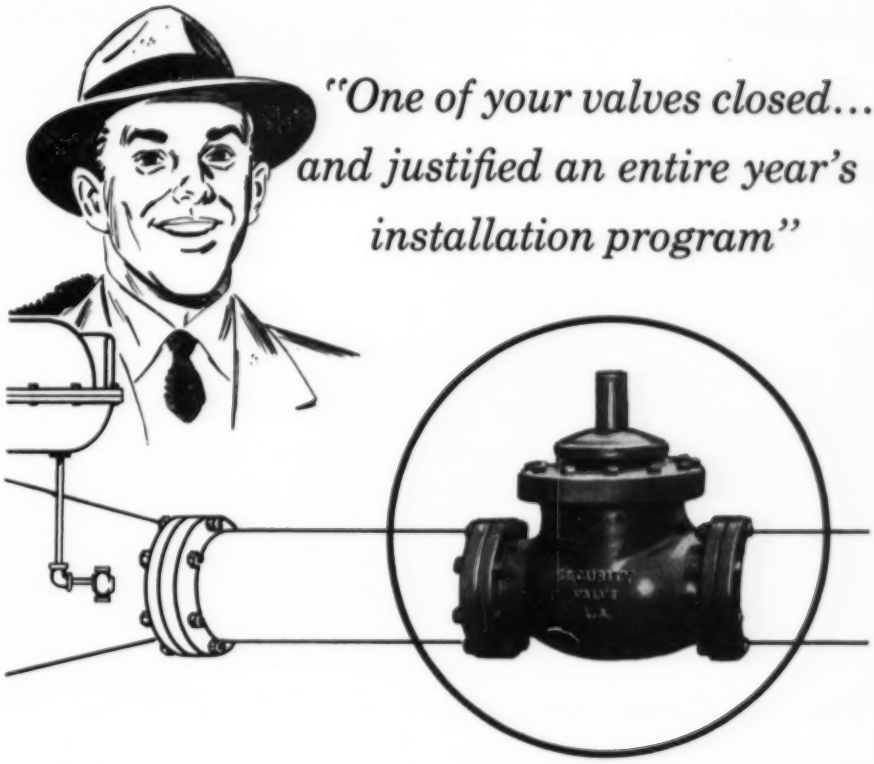
H. R. BASFORD, founder of the H. R. Basford Co., San Francisco, gas and electric appliance manufacturers' representatives, died recently. Mr. Basford was well known in Pacific Coast gas circles, having been an active member of the Pacific Coast Gas Association for many years. An honorary member of the association, and also a charter member of the 49er Club, he served the group at various times as president, vice president, and director and was a Gold Medal winner.

MAX W. BALL, petroleum consultant and former Interior Department official, died recently of a heart attack. Mr. Ball's background included experience in nearly all phases of gas and oil operations, both as a businessman and a government servant. He joined the Interior Department in 1946 and before his resignation in 1948 had served as chief of the oil and gas division. During World War II, he was special assistant to the deputy administrator of the Petroleum Administration for War.

RAYMOND LITTLE, 54, sales promotion director for GAMA, died of a heart attack in White Plains, N. Y., on Sept. 12. A graduate of the University of Pittsburgh, Mr. Little had served for 25 years with the Equitable Gas Co. in Pittsburgh. He was widely known by members of the gas industry for his valuable services in promoting gas appliance sales.

MARTIN C. MADSEN, 61, chief engineer for Northern Natural Gas Co. since 1944, died last month. He was affiliated with the AGA, the MidWest Gas Association, and the INGAA, and was a member of working committees in the AGA, the ASA, and the American Society for Testing Materials.

R. W. BOSWELL, 40, measuring engineer for the Lone Star Gas Co., Dallas, died early in September. He had been with Lone Star for 20 years.



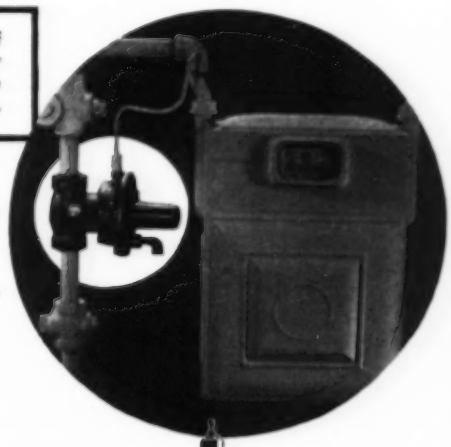
"One of your valves closed... and justified an entire year's installation program"

■ That's the experience of just one of the major gas companies and gas-using industries from coast to coast who have standardized on Security Automatic Shut-Off Valves. Because of their *absolute* protection against overpressuring, the operation of a single Security Valve can pay for a system-wide installation.

Security Valves are positive and always dependable . . . they are engineered for one specific function. Vital in congested areas, they eliminate both the expense and hazard created by high-capacity vent lines necessary when other over-pressure protection devices are employed.

A *complete* line, Security Automatic Shut-Off Valves are available in sizes ¾" to 12" for use on lines operating on inches water column to 1500 psig. They can be installed up or downstream of the regulator and controlled directly or by means of a pilot line.

Security Automatic Shut-Off Valves range from ¾" for domestic lines (right) to large distribution line sizes (above).



Nationwide representation insures fast help on your gas safety problems. Write today for the complete story and specifications of Security Valves.

SECURITY VALVE

SECURITY VALVE CORP.

541 W. GARFIELD AVENUE • GLENDALE 4, CALIF.

"Pipe installation time and labor costs cut about 50% with Greenlee Pipe Pusher"

That's what a leading eastern utility reports as its experience with a GREENLEE Pipe Pusher on jobs as shown above. Let this remarkable tool make big timesavings and reduce job costs for you, too. With the GREENLEE Pusher, *one* man pushes pipe *under* streets, walks, floors, railways, lawns, etc. Eliminates extensive trenching and time-consuming tearing up, tunneling, backfilling, repaving. Often pays for itself on the first few jobs. Two models: No. 790 for pushing ¾" to 4" pipe; No. 795 for larger pipe and concrete ducts.

POWER PUMP for all models of GREENLEE Pipe Pushers. Makes the toughest pushing jobs simple, fast for *one man*. Average pushing performance: two feet per minute. Write today for complete details on timesaving GREENLEE Hydraulic Pipe Pushers.

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GREENLEE TOOL CO., Division of GREENLEE BROS. & CO.
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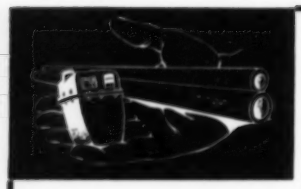


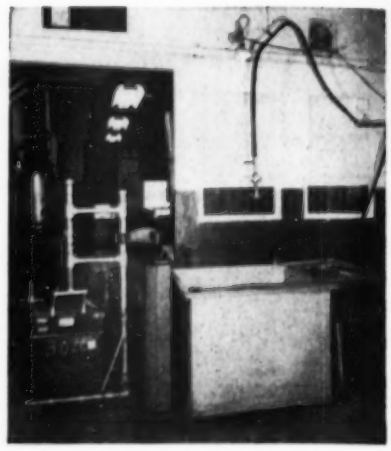
Meters raised and positioned by pneumatic lifting units

Gas meters may be lifted from floor level, positioned, lowered, and held submerged in testing tanks quickly and easily with the Dyna-Lift, pneumatic unit developed by the Hydraulic Products Co., Providence, R. I. The unit has proved highly successful in exhaustive maintenance shop tests with meters up to 60 light size.

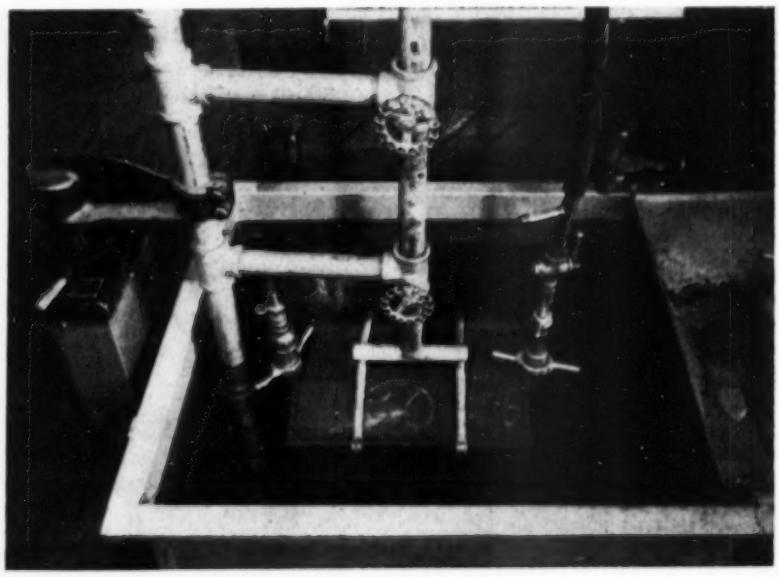
Operating on any pressure from 50 to 150 lb, the unit can lift or depress up to 750-lb capacity through a distance of 28 in. The operator may raise or lower the holding platform with a simple one-hand safety control at any desired speed. The control has three positions: up, stop, and down. Twist-type locking pins facilitate quick clamping or releasing of meters when loading or unloading at floor level.

While unit is in use lubrication is applied to valves continuously by patented "airoiler." The manufacturer reports that the valve assembly never needs greasing, and that special construction eliminates valve leakage.

The unit is 51 in. high, has a base 13 in. by 19 in., and weighs 200 lb.



Load position of Dyna-Lift, allowing floor level loading and unloading.



Meter submerged in testing position. Note hand control at left, hand-twist locking clamps on holding arms.

NO. 2 IN A "HOW-TO" SERIES

Get these Tankmaster "extras"

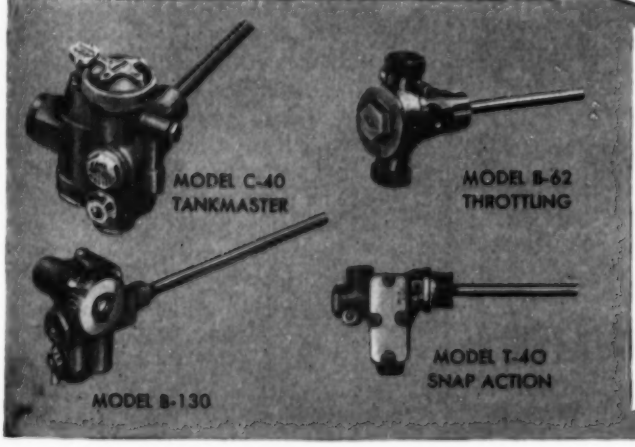
AT NO EXTRA COST

1. **EXTRA SAFE** due to Tankmaster's *exclusive* push-button pilot. 100% safe lighting. Main burner must be turned off before pilot can be lighted.
2. **EXTRA SIMPLE.** Main gas valve easily removable for cleaning should this become necessary. Simply remove valve cap and main valve is at your fingertips. No other valve affords you this simple service feature.
3. **EXTRA LONG LIFE.** Main burner valve and seat of corrosion-resistant material. All Titan controls are factory tested on LP gas to guard against seating leaks.
4. **EXTRA CAPACITY.** Insures an adequate supply of hot water at all times. More than adequate for all normal water heater operations.
5. **EXTRA POSITIVE SNAP ACTION** guarantees 100% accurate opening and closing of main burner valve, with no throttling.

* * *

These are the "extras" you get in Titan Tankmasters without spending a cent more than for ordinary controls. They're completely dependable and practically service-free, even under abnormal operating conditions. If you would like to know more about Titan Tankmasters, or any other of the complete Titan line of controls, write The Titan Valve & Mfg. Co., 9913 Elk Ave., Cleveland 8, Ohio.

TITAN



THE TITAN VALVE & MANUFACTURING CO.
9913 Elk Ave., Cleveland 8, Ohio

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Company_____

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PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN
STOPPER COMPANY

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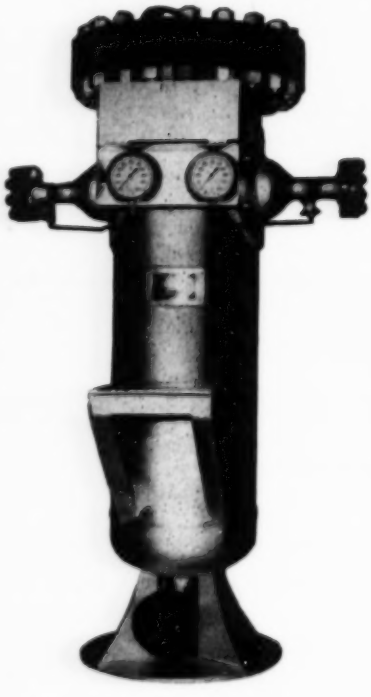
Cable Address GASTOPPER, N. Y.

HOIL ON THE LINE . . .



Hoil's positive dust scrubber assures you clean, dry gas by the dry removal of dust, line scale, and other foreign matter from your gas transmission systems. Dry particles of foreign matter present in the line are blown down instead of scrubbing with oil, thus eliminating oily residue on the downstream side. Hoil Dust Scrubbers are highly adaptable for city gate distribution systems and compressor fuel intakes.

"Hoil Clarifiers" are designed for different working pressures and inlet and outlet sizes depending on your requirements. Easily changeable filter elements are provided, and units can be furnished with a small attached winch and raising equipment making it easy to change filters. Built-in differential gauges, protected by a box attached to the front of the scrubber, show you when to make the necessary infrequent filter change.

Obtain low installation costs, dependable performance, and prompt engineering service by ordering your gas transmission positive dust scrubbers "According to Hoil".

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NEWS

City of St. Louis urges approval of Laclede plan

Declaring that the proposed underground storage project of Laclede is "in the public interest," St. Louis (Mo.) City Counselor Liberman urged state approval of the company's plan.

A favorable finding by the commission, under a new state law governing underground storage of gas reserves in Missouri by utility companies, would authorize Laclede to file condemnation proceedings in the courts to acquire underground rights where negotiations with owners for purchase of land in the storage area were not successful.

The application is opposed by some property owners in the area and by oil and gas companies interested in development of oil wells drilled in the area.

Voluntary postponement of rate case asked by Peoples

In an unusual action, the Peoples Natural Gas Co., Pittsburgh, voluntarily proposed to the PUC that the effective date of the company's new rate increase be postponed beyond Sept. 1. The move was made to give the commission additional time to consider the case.

"Because the City of Pittsburgh had only last week completed its case of opposition to the increase at final hearings . . . the commission would need more time to review the case," H. D. Borger, vice president of Peoples, said.

Peoples is seeking additional revenue amounting to $5.3 million. The new schedule of rates, filed by the company in September 1953, has been suspended twice by the commission, and would automatically have gone into effect on Sept. 1 if Peoples had not asked for the postponement.

Cooperation agreed upon by Houston Natural and city

Houston Natural Gas Corp. and the city of Houston itself have agreed to cooperate in any future expansion of their gas services to avoid duplication and provide economical service. The agreement was reached after a conference that was prompted by a proposal to annex to the city a large section (half as big as the present city area). Houston Natural now serves part of the area to be annexed, as well as two areas that are now inside the city limits.

The agreement calls for "co-engineering" all expansion projects, which means that both the city and the gas company will check with the other before making any improvements.

City Manager McClure pointed out that the city has taken the position that it eventually wants to acquire the facilities of the gas company, which now has one franchise due to expire in January 1956 and another that the city may buy at its option in 1959. Under the present policy, the city would acquire these properties at those dates.

The city has no other policy in regard to gas service than the one formulated a year ago when the Gas Advisory commission recommended that the city acquire gas company properties when the firm's franchises expired and that the city expand its own service facilities. There is no current policy to prevent the city from issuing new franchises in other areas. However, the city has not indicated a willingness to issue new franchises, although such a course has not been ruled out.

Tulsa company sponsors heat transfer school

The first heat transfer short course ever to be held outside of educational institutions was recently attended by 19 engineers from 16 firms.

Sponsored by the Happy Co. of Tulsa, the course included 30 hours of lecture and discussion of rating and selection of atmospheric sections; shell and tube equipment; fin-type air cooled equipment; water, oil and gas equipment; cooling and condensing of hydrocarbon streams; fuel testing procedures; quotation evaluation; history of air-cooled equipment; and theoretical basis of all types of heat transfer equipment.

In charge of the course was John Mahaffey, Happy Co. vice president; chief instructor was W. F. Roberts, rating engineer.

United Fuel will build 11-story office building

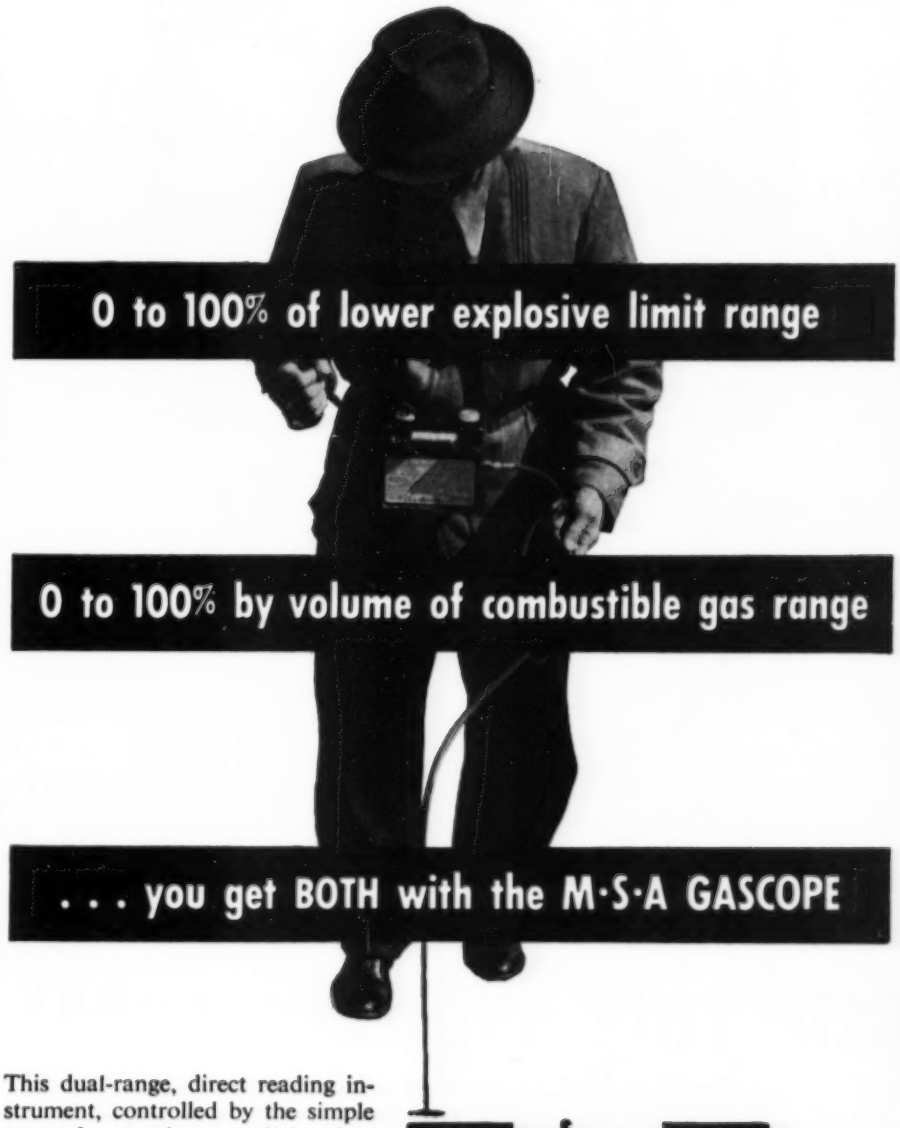
Contract for construction of an 11-story headquarters office building for United Fuel Gas Co. and affiliated companies of the Charleston Group, Columbia Gas System, has been awarded to Southeastern Construction Co. of Charlotte, N. C.

Southeastern's successful bid was $5.8 million. Ground was broken in September and completion of the building is specified by June 1, 1956.

New York Life Insurance Co. will provide money for building costs, take title to the property and lease it to United Fuel under a long-term sale and lease-back plan.

The building will rise on an 18-acre tract beside the Kanawha river. The architects say that except for the State Capitol about a mile farther upstream, the headquarters will have the largest gross floor area of any building in West Virginia, more than 250,000 sq ft.

Six companies comprise the Charleston Group to which the headquarters will be "home." They are United Fuel, Amere Gas Utilities Co., Atlantic Seaboard Corp., Big



This dual-range, direct reading instrument, controlled by the simple turn of one selector switch, gives you accurate, quick gas detection over the entire range from 0 to 100% by volume. And no air dilution accessories are required.

The story of this new simplicity, new adaptability is told by the control panel in the picture at the right. The range from 0 to 100% gas concentration is covered in two scales. When gas is detected above the LEL range, a turn of the switch transfers the indication to the higher 0 to 100% gas concentration scale.

This unit is the modern answer to fast, dependable detection and location of gas leaks. Write for details, or ask for a demonstration. Your request will be handled promptly.

The Gascope is light, easy to use, and demands no special skill to operate.

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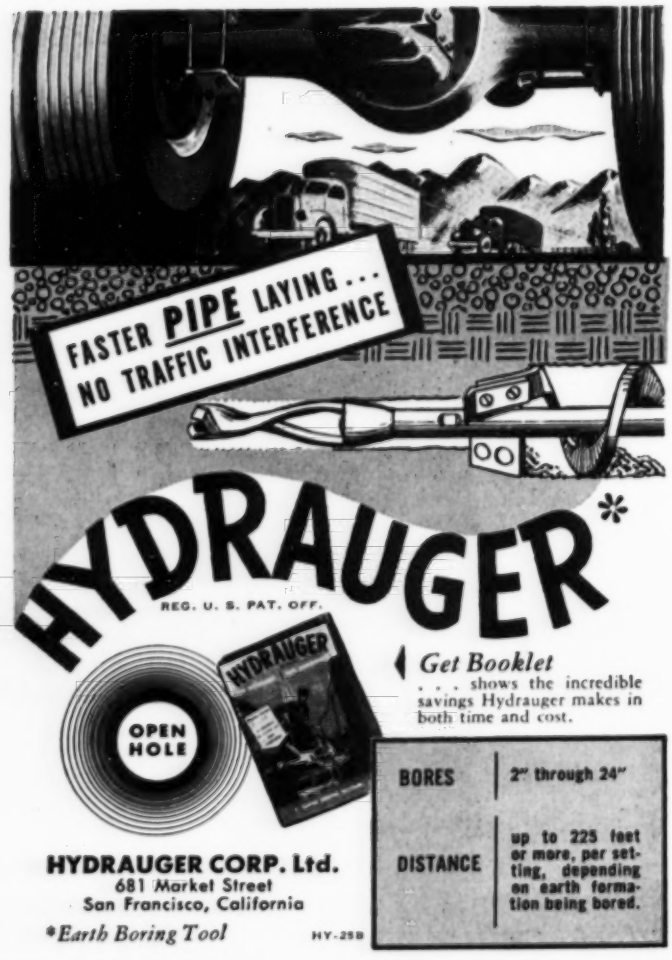

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Marsh Oil Co., Central Kentcky Natural Gas Co. and Virginia Gas Distribution Corp.

At present about 700 persons making up the general office force of these companies occupy space in ten locations in downtown Charleston. All general office personnel will move into the new building.

Appliance discrimination hit by "Companion"

A recent item in the "Companion Trade Topics" warrants reprinting:

"Discrimination against appliances by FHA in the open-end mortgage setup has stunned the whole industry. . . . Such action challenges our American standard of living. . . . It's a boomerang, as the rules now stand, which actually can drain money away from home improvement through modernization of kitchens and laundries. . . . But, possibly the FHA action was a 'stop gap' until Congressional instructions—and there's some hope of correction before too long."

Robertshaw's expansion program continuing

Ground was broken in Milford, Conn., last month for a new $2 million plant of the Bridgeport Thermostat division of Robertshaw-Fulton Controls Co. Located six miles from the heart of downtown Bridgeport, the modern one-story plant will be nearly double the size of the present plant.

With the new plant, another chapter is added to the expansion story of Robertshaw-Fulton, which since the first of the year has added new facilities or begun construction

Correction

In the recent issue of WESTERN GAS published for the annual convention of the PCGA in Vancouver, the statement was made that the National Steel Construction Co. of Seattle had been acquired by Continental Water Heater Co., Los Angeles.

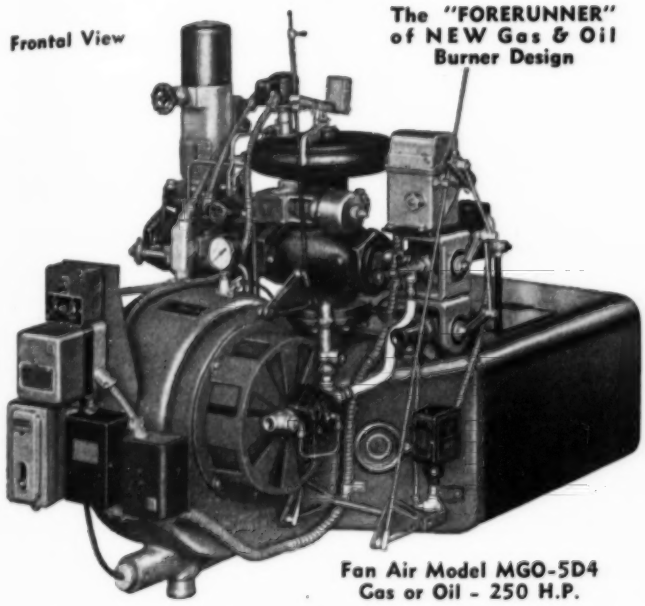
This information was not correct, inasmuch as Continental Water Heater Co. has been operated as a subsidiary of National Steel Construction Co. for a number of years.

Water heaters for the gas industry are now manufactured at the Continental Water Heater Co. in Los Angeles. If conditions warrant, however, Continental water heaters will be produced by the parent company, National Steel Construction Co., in Seattle. A third manufacturing plant operated by this organization is the National Steel Construction Co. of Logansport, Ind. This plant also manufactures gas water heaters.

Mettler "FAN-AIR" AUTOMATIC MECHANICAL DRAFT "PACKAGED" GAS BURNERS *and Companion* DUAL FUEL BURNERS

Frontal View

The "FORERUNNER" of NEW Gas & Oil Burner Design



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Gas or Oil - 250 H.P.

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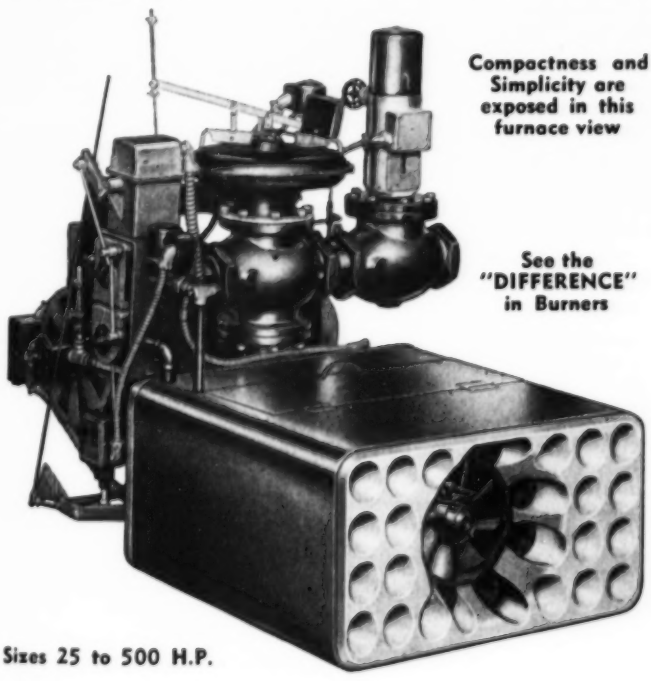
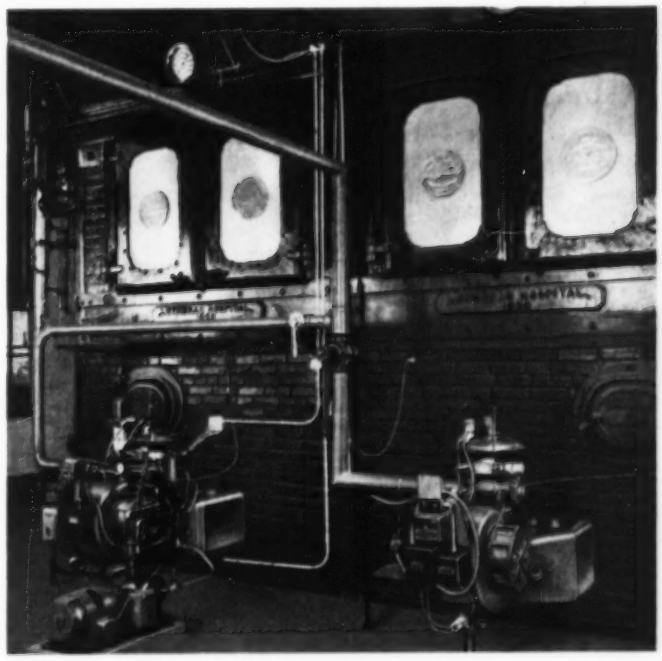
Compactness and Simplicity are exposed in this furnace view

See the "DIFFERENCE" in Burners



Sizes 25 to 500 H.P.

In a modernization program this institution selected Mettler **FAN-AIR** Mechanical Draft Automatic Gas Burners to replace Coal in one boiler initially. Subsequently the adjoining boiler was equipped with the Fan-Air (**MGO**) **DUAL FUEL BURNER** thus providing increased Safety Factor, greater flexibility with substantial fuel savings and many other accruing benefits from **Gaseous Fuels.**



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- Only (1) motor and (1) fan required to furnish all (100%) of air for burning gas or oil fuel.
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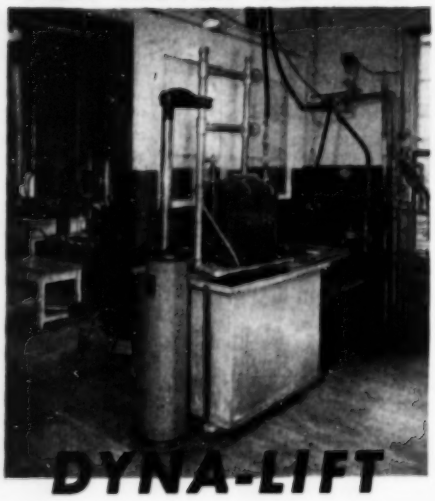

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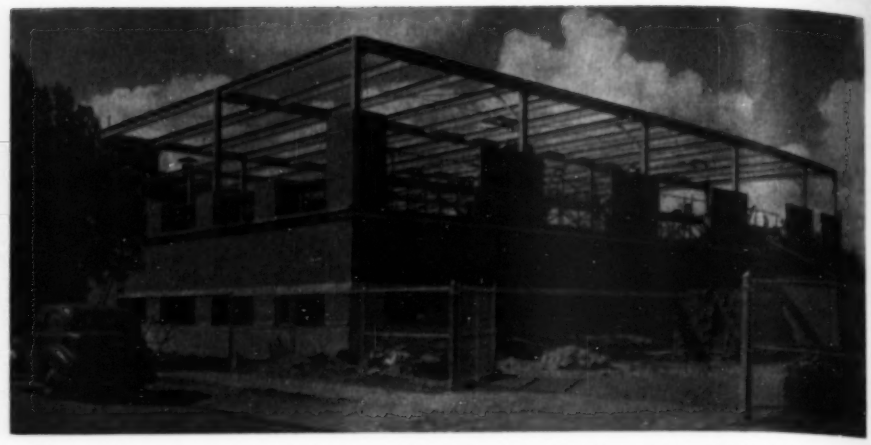

Rapidly taking shape is the 17,800 sq ft north wing addition of the AGA Laboratories in Cleveland. The expanded facilities provide 23 additional testing stations which are to be used mainly for approval testing of central heating equipment and domestic gas incinerators. Completion is expected during November.

at Irwin and Indiana, Pa., Anaheim and Long Beach, Calif., and Toronto, Canada.

The modern Milford plant will contain 180,000 sq ft of floor space on 15 acres, as compared with 95,000 sq ft in the present outgrown plant. Offices, engineering department and laboratory will occupy 25,000 sq ft in the new structure. The tract is large enough to double the planned manufacturing area.

Plans are to manufacture the same line of products—mainly metal bellows and controls utilizing bellows—presently manufactured by Bridgeport Thermostat, and to continue the present policy of expanding the Division's product lines. Completion of the new plant is scheduled for June 1955.

HELP WANTED

Manufacturer's Representative, currently calling on Gas Companies and Utilities, for representation of one-piece fiberglass METER DOMES for covering outside meter sets. Replies should include experience, education and lines currently represented. Contact

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PALO ALTO, CALIFORNIA

SoCal marks half-century in San Gabriel valley

The Southern California Gas Co. recently marked a half-century of progress in the gas business in the San Gabriel valley with a week-long celebration held in the company's recently modernized northeast division headquarters.

Keynote of the jubilee was the opening to the public of the headquarters building following a $200,000 remodeling program. The 50 years of progress date back to 1904 when control of gas companies operating in the area first passed to a predecessor of the present Southern California Gas Co.

Operating revenues reach new high

Total operating revenues of the gas utility and pipeline industry reached a record high of $4434 million during the 12 months ending June 30, 1954, the AGA reports. This is a gain of $489 million, or 12.4% over the figure for the comparable period one year earlier. Net operating revenues increased from $544 million to $589 million in the same period, a gain of 8.3%. Net income was $435 million in the cumulative period, a gain over the year earlier of 6.4%.

Total taxes for the twelve-month period ending June 30, 1954 were $566 million or 12.8% of total operating revenues received by the gas utility industry. This figure is 8.8% higher than the total taxes of $520 million paid by the industry for the like period last year.

Total revenues of gas utilities and pipe-

lines from sales of gas to ultimate consumers (not including sales to other utilities for resale) for the second quarter of 1954 were $685 million, a gain of 7.7% over revenues of $636 million in the comparable quarter of 1953. For the 12 months ended June 30, 1954, revenues from sales to consumers totaled $2877 million, a rise of 10.2% over $2610 mililon in the previous 12-month period. Industrial gas revenues rose 10.7% during the 12-month period, while residential revenues gained 10.0%.

Sales of gas in the second quarter of 1954 amounted to 14,006 million therms, an increase of 5.1% over the 13,332 million therms sold in the same quarter of 1953. For the 12 months, sales of gas aggregated 58,789 million therms, an advance of 6.5% over 55,205 million therms in the comparable period a year earlier.

Revenues from the sale of natural gas to ultimate customers for the second quarter of 1954 were $575 million, an increase of 9.7% over $524 million a year earlier. For the 12 months, natural gas revenues were $2430 million, or 12.8% above revenues of $2153 million in the previous 12-month period.

Sales of natural gas in the second quarter of 1954 were 13,198 million therms, up 5.4% over the 12,524 million therms sold in the like 1953 quarter. Natural gas sales totaled 55,568 million therms for the 12-month period, a gain of 6.9% over sales of 51,958 million therms in the previous 12 months.

Rowan named coordinator of Portland's conversion

Appointment of Ed Rowan as coordinator of Portland (Ore.) Gas and Coke Co.'s natural gas conversion program was announced recently. The prospect of natural gas coming into the area in the near future is much more definite as a result of the recent granting of a certificate of convenience and necessity to the Pacific Northwest Pipeline Corp. by the FPC.

The company's conversion plans are being worked out with Conversions and Surveys Inc., a subsidiary of the engineering firm of Stone & Webster. PG&C plans to adapt its distribution system to serve natural gas and to convert its customers' appliances to the use of the new fuel with a minimum of inconvenience and a maximum of service, with no cost to the customer.

BU announces employee stock purchase plan

In response to demand on the part of employees, Brooklyn Union Gas Co. has initiated a plan whereby deductions as low as $2 per week may be authorized by workers for the purchase of company common stock. The regular weekly payment may be supplemented by special deposits of any desired amount

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STANDARD OF EXCELLENCE IN Gas UNIT HEATERS

A new concept in Unit Heaters — *new* inside and out. Stimulating styling that sells . . . plus more engineering achievements that surpass all others. Efficiency and rugged construction for the toughest heating task. Top flight quality to suit even the most conservative buyer has established the name —Peerless—that has been counted on for dependability for 70 years.

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100,000 BTU — 150,000 BTU & 200,000 BTU

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Without obligation, please send me descriptive literature on your new hinged pipe cutters.

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Corrosion engineers of the Columbia Gas System recently toured the Waterville, Ohio, plant of Glass Fibers Inc. Shown at the luncheon following the tour are (standing, l to r): M. W. Gregory and R. W. Capoul, Glass Fibers; Frank Costanzo, Manufacturers Light; James Hopkins, Ohio Fuel; Herbert Byrnes, Columbia's service corp; George Orr, United Fuel; and William Kretchmer of the service corporation. Seated: John Keenan and Thomas A. Collins, both of Glass Fibers; and Edward Davis, Ohio Fuel.

and as often as desired.

Under the plan, the company will put the money deducted from the payroll into one lump sum and at the end of each month the Guaranty Trust Co. of New York, custodian of the money, will instruct a broker on the N. Y. Stock Exchange to buy as many shares as is possible at the prevailing price. Dividends may be invested in the purchase of additional shares of stock, or employees may arrange to have them sent to them by check. Dividends will be paid even on fractional shares if so desired by the employee.

A statement of the stock purchased will be sent to all participating members of the plan each quarter. As shareholders, they will be entitled to vote the stock and will receive stockholder notices and reports.

Gas sales reached new high level in July

Total sales of gas to ultimate consumers of the gas utility and pipeline industry during July 1954, amounted to 3846 million therms, equal to an increase of 6.7% over total sales of 3604 million therms in July of last year. This total represents an all-time high in gas sales for the month of July, the American Gas Association reports. Gains in industrial sales, particularly in the Southwest, as well as the steady increase in numbers of gas customers throughout the nation account for the increase in gas sales.

Utility and pipeline sales of natural gas during July 1954 totaled 3661 million therms, also a new record level of natural gas sales for the month of July. This total represents an increase of 7.1% over sales of 3419 million therms in July, 1953.

Sales of manufactured and mixed gas showed an increase of 0.3% in July, rising to a total of 185 million therms. Sales of mixed gas were up 15.2% while those of straight manufactured gas declined 38.1%. The continuing decline in manufactured gas sales reflects conversions during the year from distribution of manufactured to natural or mixed gas.

Consumers Gas preparing market for gas arrival

With the delivery of Texas gas less than two months away, Consumers Gas Co. of Toronto is stepping up efforts to clarify the whole marketing situation in its big franchise area.

Preliminary discussions with the Ontario Fuel Board on gas rates are underway and an ambitious sales promotion campaign has been drawn up. Early conversion work on burners is underway and the training school for conversion workers is in operation.

Natural gas common stock price index up

The month of August continued to reflect the generally optimistic attitude prevailing in the stock market. At the close of the month the composite price index of the 30 utilities comprising a representative cross-section of natural gas common stocks actively traded was 20.9% greater than for the comparable period last year. Dividend increases of only 8.3% on these stocks, however, resulted in a relative decline of 10.4% in yields when the same periods are compared. These data are reported weekly in Moody's Public Utilities and are summarized monthly by the AGA.

The component parts of the index reflected the same general increases as the total index. Distribution companies' common stock prices showed the larger relative increase of 25.0% during the period, while gas transmission stock prices increased 18.2%. Accompanying these price changes were increased dividend payments of 8.0% and 7.1% for the distribution and transmission components of the index. As in the total index, the larger relative increases in prices than in dividend payments for these common stocks resulted in reduced yields of 13.6% and 9.5% for distribution and transmission companies, respectively. The average yield on gas distribution common stocks at the end of August was 4.83%, and that of the gas transmission common stocks was 4.66%.

News Notes

"Progress Through Controls," a 21-minute film in color produced by General Controls Co., presents a comprehensive, pictorial description of the automatic controls field. The film traces the use of automatic controls through many of their varied uses—home heating systems, automatic gas appliances, processing plants, and in the aircraft industry.

Negotiations toward a merger of Consolidated Gas Utilities Corp. with Oklahoma Natural Gas Corp. have been discontinued, according to Joseph Bowes, president of Oklahoma Natural. (See September GAS, page 95.)

PUC approval has been received by United Natural Gas Co., Oil City, Pa., to extend its services to the Cambridge Springs-Venango-Woodcock areas of Crawford county. United will spend about $300,000 to extend its lines to 700 new consumers in the areas.

The new round home thermostat developed recently by Minneapolis-Honeywell Regulator Co. is one of 50 examples of American industrial design selected for display at the 1954 Triennale Fair in Milan, Italy.

The laying of 900 ft of 2-in. line in Shreveport recently marked the first time that plastic pipe has been used in that city. The section of line was installed under the direction of the Shreveport operating department of the Arkansas Louisiana Gas Co.

Milwaukee (Wis.) Gas Light Co. is in the process of increasing its number of gas space heating customers by 2784 to a total of 63,284. Dudley B. W. Brown, president of the company, said that the increase would be made under an amendment filed with FPC and an order of the state public service commission.

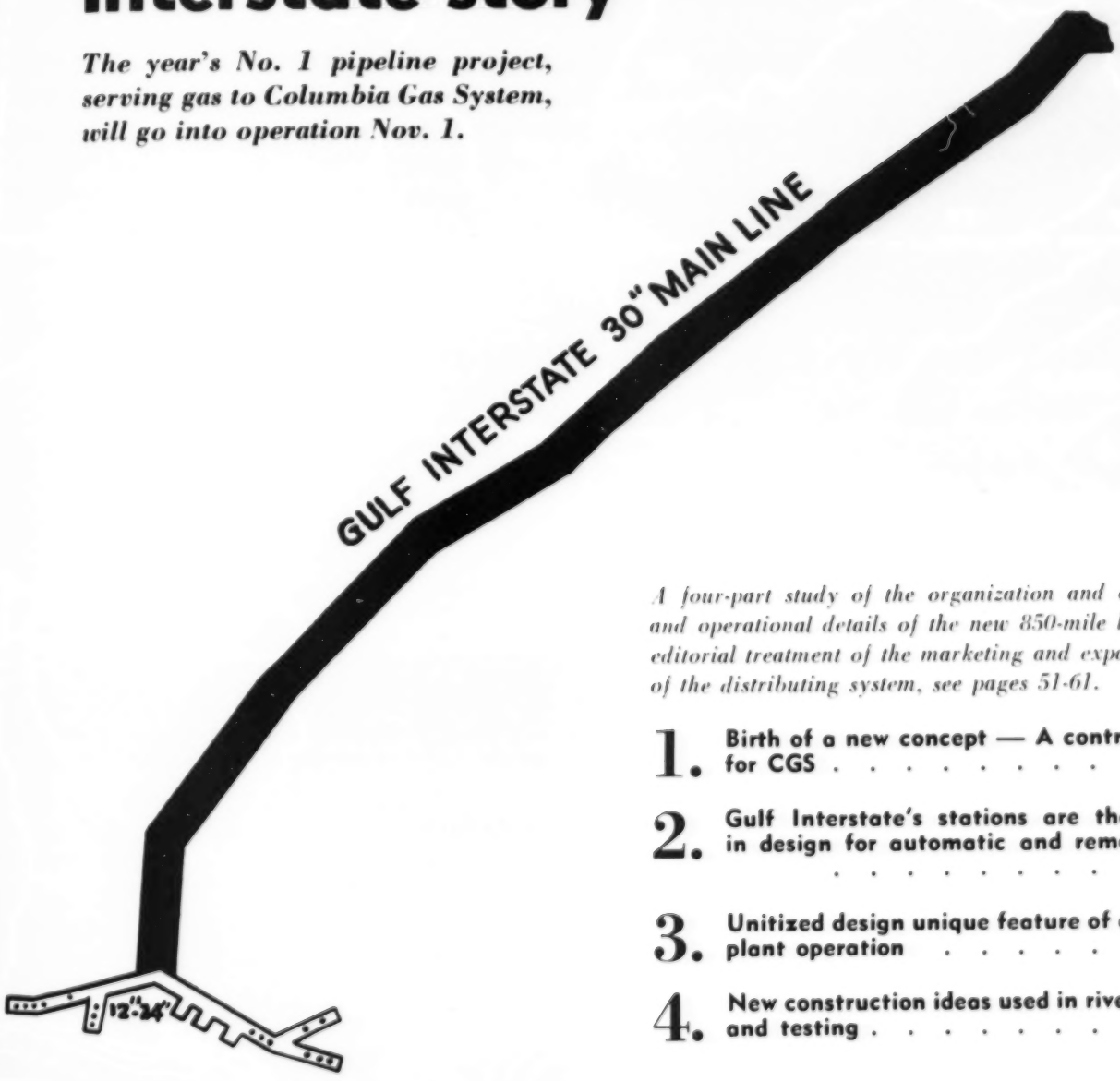
Merger of the Coast Counties Gas & Electric Co. in Pacific Gas & Electric Co., San Francisco, was completed recently when PG&E filed a certificate of ownership with the Secretary of State of California. As a result of the merger, 139,283 gas, electric and water customers of Coast Counties became PG&E customers.

GAS

Transmission and Conditioning Section

The Gulf Interstate story

The year's No. 1 pipeline project, serving gas to Columbia Gas System, will go into operation Nov. 1.



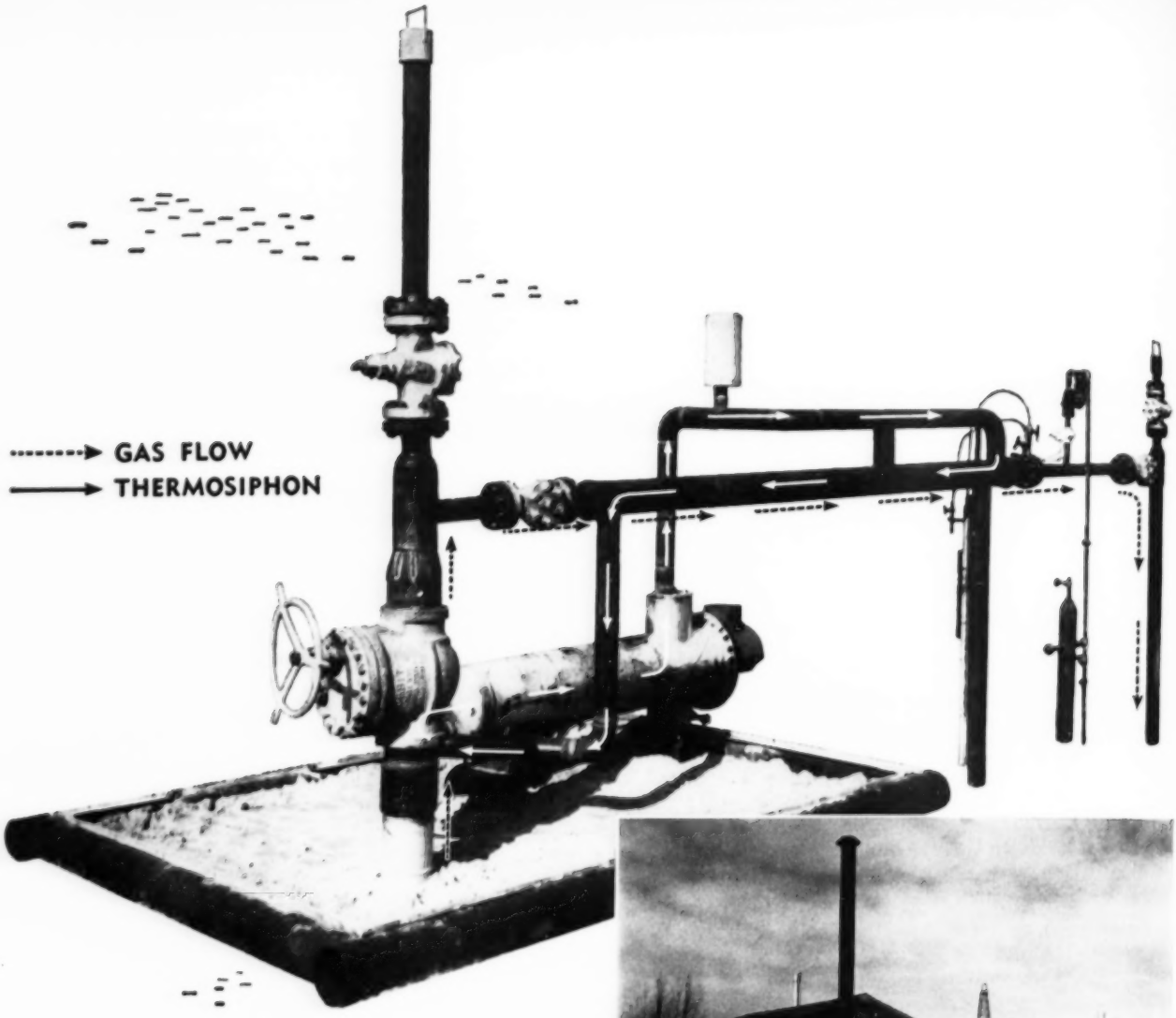
A four-part study of the organization and construction and operational details of the new 850-mile line. For an editorial treatment of the marketing and expansion plans of the distributing system, see pages 51-61.

1. Birth of a new concept — A contract carrier for CGS 131

2. Gulf Interstate's stations are the ultimate in design for automatic and remote control 135

3. Unitized design unique feature of compressor plant operation 142

4. New construction ideas used in river crossings and testing 152



GAS UTILITY USES 225 NATIONAL HEATERS... SAVES $900 PER MONTH

SITUATION — Underground natural gas storage area in Central Michigan underlying 25 sections of land. Input pressures range from 307# psi to 700# psi. Gas is dehydrated before storage.

PROBLEM — To find a heater

1. That would give a 35 degree temperature rise to a gas stream whose maximum flow would be 500,000 cu ft. per day.
2. That was small enough to fit in a small house covering both the wellhead and the heater.
3. That would operate at maximum efficiency since all gas consumed in the heater cost approximately 30 cents per thousand cu ft. at the wellhead.

RESEARCH — Several types of "home-made" and commercial heaters were tried along with National's 16" x 6', Model CA124 Horizontal Heater.

RESULTS — By actual fuel consumption tests, using identical hook-ups, National's heater outperformed all others using exactly one half as much fuel as the competitive models. The gas utility shows a savings of $900.00 per month, based on a 12-month gas expense period. These savings are based on actual tests. They are effected by using 225 National 16" x 6' direct heaters — indirectly — in this one area.

It's National

NATIONAL TANK COMPANY

TULSA, OKLAHOMA

Part 1

Birth of a new concept— a contract carrier for CGS

GAS exclusive

A HIGHLY efficient, streamlined approach to the problem of transporting large volumes of natural gas has been taken on the new Gulf Interstate Gas Co. pipeline system which goes into operation this fall.

At every step along the way—organization, administration, construction, and operation—Gulf Interstate has set an advanced pattern for the transmission industry. In all phases of its program the purpose has been crystal-clear: to build a pipeline system that could transport gas the cheapest and most efficient way possible.

With $130 million invested in its 1150-mile transmission system, Gulf Interstate will soon have an opportunity to prove the worthiness of this undertaking. Starting on Nov. 1 it will begin transporting a maximum of 375 MMcf of natural gas daily for use by the Columbia Gas System. Both Columbia and Gulf Interstate are convinced that this gas will move from the wellhead to the distribution point at a minimum cost.

It was because Columbia had need for a large and dependable volume of gas to augment its current supply that the idea for Gulf Interstate was born. Columbia's great market area was experiencing a continuing industrial growth and fuel supplies played a key role in this expansion. As the demand for natural gas continued to increase, Columbia began to look for a direct source of supply.

Idea for a pipeline

Meanwhile, thoughts of building another pipeline were on the mind of Hy Byrd, one of the country's best known pipeline executives. Mr. Byrd's idea for a 30-in. pipeline from southern Louisiana to West Virginia appealed to Columbia and in a matter of weeks Gulf Interstate began to take shape on paper.

The new company was incorporated in the state of Delaware on Feb. 21, 1952. Fifteen months later, on May 20, 1953, it was granted a certificate of convenience and public necessity by the Federal Power Commission. In July of 1953 there was a public sale of Gulf Interstate securities.

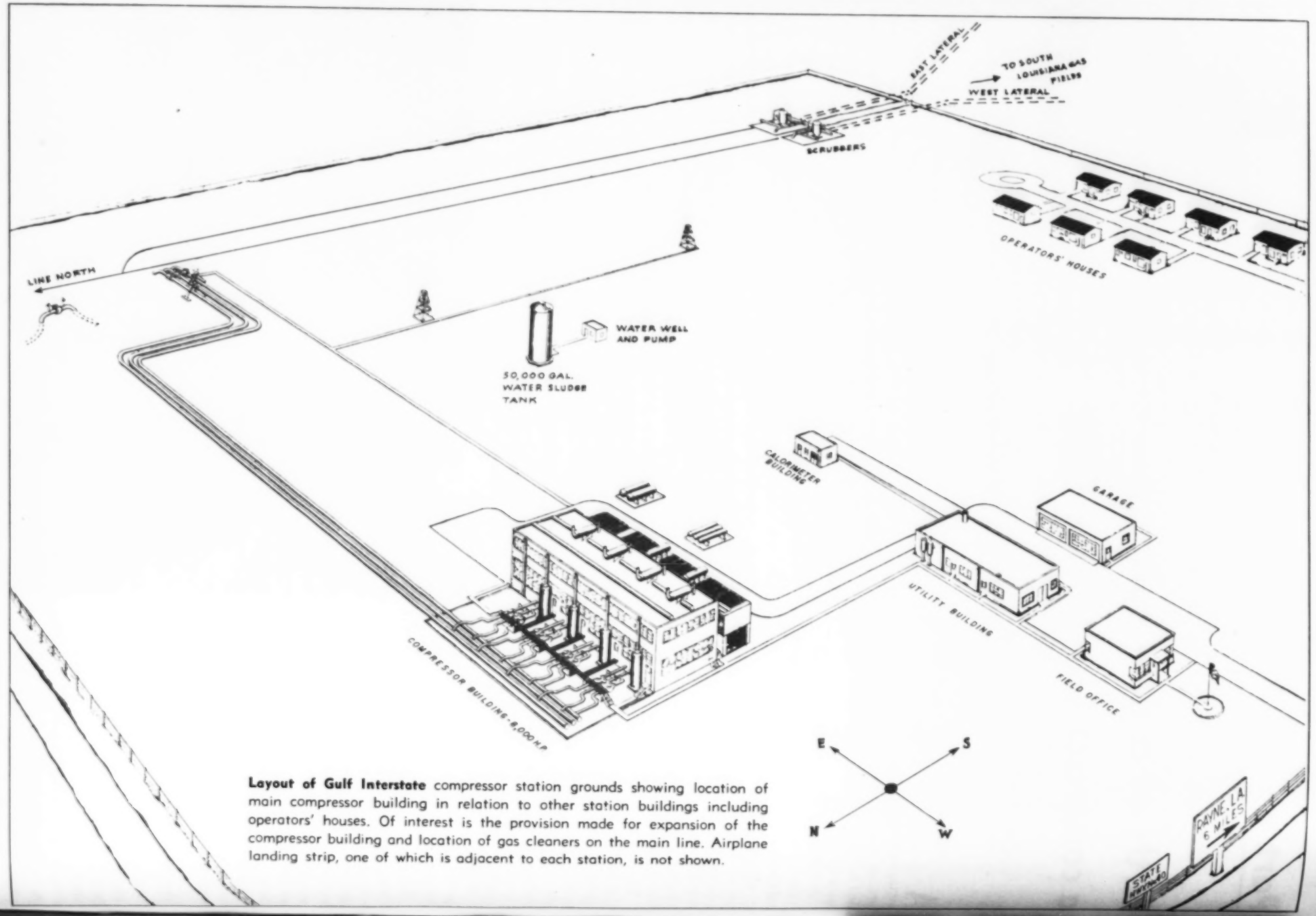
During these formative months a lot of things were happening that were destined to set Gulf Interstate in a class by itself among gas transmission companies. First of all was Gulf Interstate's contract with Columbia.

A subsidiary of Columbia—United Fuel Gas Co.—was made responsible for purchasing the necessary gas and developing sufficient reserves in southern Louisiana to insure a continuous volume for the new line. Gulf Interstate assumed the task of transporting the gas to a point near Kenova, W. Va., from where United Fuel is building a 57-30-in. line to connect with its system.

As soon as the gas is delivered to United Fuel it will enter Columbia's "pooled supply" for subsequent distribution to 15 operating subsidiaries. These distribution companies serve nearly three million customers in the states of Ohio, Pennsylvania, Kentucky, West Virginia, Virginia, Maryland, New York, and the District of Columbia.

Under this arrangement with Colum-

Gulf Interstate and Columbia Gas Co. officials pictured during a visit to construction work on the new system's mainline.



Layout of Gulf Interstate compressor station grounds showing location of main compressor building in relation to other station buildings including operators' houses. Of interest is the provision made for expansion of the compressor building and location of gas cleaners on the main line. Airplane landing strip, one of which is adjacent to each station, is not shown.

Aerial view of one of the Gulf Interstate compressor stations during construction stage. Operators' houses are in foreground with compressor and utility buildings in background.

bia, Gulf Interstate will serve only as a contract carrier and will not be involved in gas purchases or sales. It will be compensated for providing the pipeline capacity plus reimbursement of its operating expenses.

Gulf Interstate's financing was arranged through the sale of $96 million in 4⅛% first mortgage pipeline bonds, plus the sale of 723,987 units consisting of one $20 par value interim note and five shares of common stock of $5 par value, which were sold for $48.75 per unit.

Talented engineers

Much of the credit due for the planning and construction of the Gulf Interstate system belongs to a talented and energetic group of engineers, many of whom had worked together for a number of years. In record time these men were able to plan and build a huge new pipeline system that incorporates many advanced design and operating features. This was done without the supervision or inspection by an outside engineering firm which is normally required by investors for a new project of this magnitude.

The Gulf Interstate line was planned throughout for economy of operation. A 300-mile gathering system collects gas from producing areas in southern Louisiana. This gas starts up the mainline at Rayne, La., and travels across Louisiana, Mississippi, Tennessee, and Kentucky for 845 miles before reaching the point of delivery at the West Virginia border.

Approximately 265,000 tons of steel were required for the 30-in. mainline, while another 45,000 tons were used in building the gathering system. This pipe was supplied by National Tube Division and Consolidated Western, subsidiaries of U. S. Steel; Youngstown Sheet & Tube; Republic Steel; and A. O. Smith Corp.

These contractors aided in construction of the gathering system: Williams Brothers Co., Associated Pipe Line Contractors Inc., and Anderson Brothers Corp. Much of this right-of-way lay across mosquito-infested swamps and shallow lakes, where pipelining is always extremely difficult and where it often reaches the impossible stage.

Construction of the mainline was divided between Houston Contracting Co. and H. C. Price Co. At times these two companies were using as many as seven "big inch" spreads—each representing more than a million dollars worth of equipment—on the Gulf Interstate project. During the four months of construction prior to last winter's shutdown the two companies laid 650 miles of 30-in. to gain for the pipeline a title of "fastest big inch ever built." This record was established despite the fact that sections of the right-of-way were so clogged with rock that 2½ million lb of dynamite was required to open a ditch across Tennessee and Kentucky.

Compressor stations

At intervals of approximately 180 miles along the mainline Gulf Interstate has constructed five compressor stations to help push the gas northeastward. These stations are located at Rayne and Delhi, La.; Banner, Miss.; Hampshire, Tenn.; and Clementsville, Ky. The southern three stations have been erected by Tellepsen Construction Co., while the northern two were built by J. F. Pritchard & Co.

At each of its compressor stations Gulf Interstate has installed four 2000-hp engines, giving it a total of 40,000 hp in the system. (Cooper-Bessemer engines were installed at Rayne, Banner, and Clementsville, while Clark engines are being used at Delhi and Hampshire.) These stations will provide an initial delivery of 375 MMcf daily. Should it later appear desirable, this daily output could be increased to 565 MMcf daily by the addition of five more compressor stations and a boost of total horsepower of 140,000.

A semi-automatic, push-button control system will permit Gulf Interstate to run each of its stations with but a single operator per shift. VHF radio, teletype, and leased wire telephone lines will provide communications between compressor stations, intermediate locations, mobile equipment, and the company's Houston headquarters.

For each of these stations Gulf Interstate acquired a site encompassing approximately 40 acres. Principal structures at a station include the main engine building and annex, an auxiliary building, garage, office, water tank, oil tanks, scrubbers, and camp. The latter consists of seven modern three-bedroom homes, which are alloted at each station to the district superintendent, assistant superintendent, chief mechanic and four operators. These employees are required to live on the premises, paying an extremely small monthly rental which includes utilities and maintenance.

Employee program

Gulf Interstate expects to start operations on Nov. 1 with a total payroll in the field of approximately 250 men, plus an additional 125 employees in its Houston headquarters. The company has established an extremely liberal program of employee benefits that includes life insurance, sickness and accident in-

surance, hospital expense and surgical operation insurance, and a retirement plan.

Indicative of Gulf Interstate's attitude toward both its employees and the public is a recently concluded series of open houses held at the company's five compressor stations. The purpose of these open houses was to provide a means whereby employees and their families could become better acquainted with residents in surrounding communities, as well as to enable the local citizens to familiarize themselves with operations of the transmission company.

Visitors to the compressor stations were extended a cordial welcome by a Gulf Interstate official, then directed on a tour of the sparkling clean installation. Light refreshments were served at the end of the tour and the guests were also provided with an illustrated brochure describing Gulf Interstate's activities. A total of nearly 20,000 persons visited the five open houses.

The Gulf Interstate team

Behind the inspiration and effort that have produced the new Gulf Interstate system is a team of men that approaches its jobs with a real sense of devotion to duty. Gulf Interstate has carefully avoided a departmentalized type of organization and has come up with a streamlined administration that knows how to cut through red tape.

A large number of key positions in the company are filled by young men possessing both enthusiasm and outstanding professional backgrounds. There is no "clock-watching" among these people, many of whom will be found back in their offices at night and on weekends.

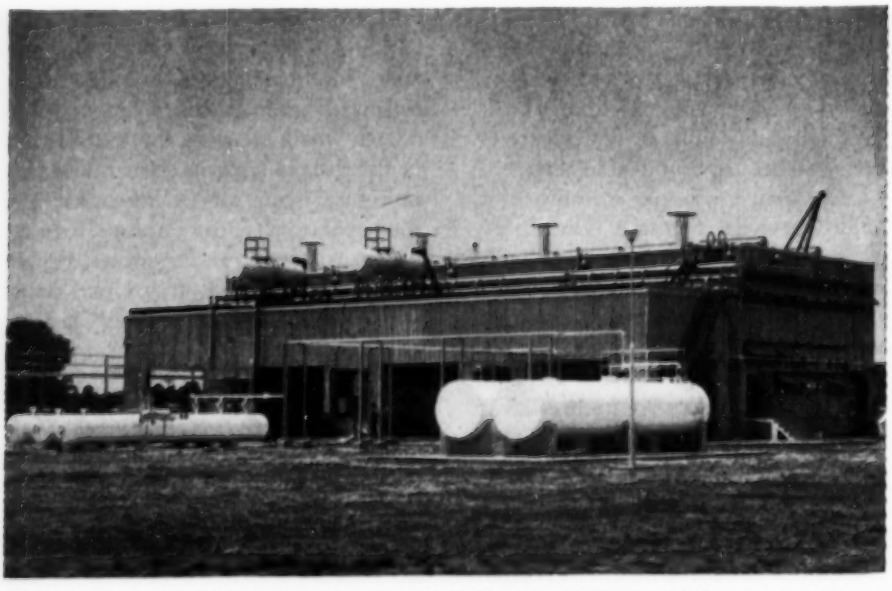
Biographical highlights on some of the company's key personnel follow:

Leader of the Gulf Interstate team is Hy Byrd, president and chief executive officer. A legal and banking background paved the way for Mr. Byrd's entry into the oil and gas industry, where he has acquired over 20 years experience as a ranking executive in several large organizations.

Farrile Young, vice president in charge of operations and engineering, is one of the country's best known pipeline engineers and heads the group responsible for the many unique design features and operating techniques put to use by Gulf Interstate. He is a graduate of the University of Kansas and began his engineering career with Phillips Petroleum Co.

Norman F. Blundell, Gulf Interstate's chief engineer, started with the Michigan-Toledo Pipe Line Co. following his graduation from the University of Nevada. During the past 13 years he has held top engineering positions in the pipeline industry.

The company's treasurer and assistant secretary, J. A. Staples, is a certified public accountant with many years experience in electric and gas utility firms. He served as an accountant with the Federal Power Commission for eight years.



General view of one of the compressor buildings showing location of the structure housing the cooling fans for each of the compressor engines. Space between the openings, where fan is located, is used to house engine auxiliary facilities.

General superintendent, Seymour (Sy) Orlofsky, is a graduate of the Missouri School of Mines and was a navy officer during World War II. He has had several years experience as a pipeline engineer.

Gulf Interstate engineering

With its new pipeline system soon to be ready for operation, Gulf Interstate is not resting on its laurels. A subsidiary organization, Gulf Interstate Engineering Co., is staffed by the same group of officers as in the gas company. This subsidiary will contract to engineer, design or build pipelines, compressor stations, or allied facilities for the oil and gas industry. Its services will include such specialized activities as surveying and cleaning and testing.

First engineering and design project to be undertaken by Gulf Interstate Engineering Co. is a 215-mile, 6-in. products line from Cheyenne to North Platte which is being built for Wyoming-Nebraska Pipe Line Co.

The new line starts at Frontier Refining Co.'s tank farm at Cheyenne and runs eastward through Sidney, Neb., where a terminal will be located, and on to North Platte. Initial capacity of the system will be 8000 bbl a day from Cheyenne to Sidney and 6000 bbl a day to North Platte. A pumping station is to be built at Cheyenne along with a dehydration plant and interconnecting lines with the Wyco Pipeline Co. system.

Houston Contracting Co. is laying the pipe and building station facilities. Gulf Interstate Engineering, H. C. Price Co., and Houston have formed a joint venture for the purpose of constructing the line.

There is a definite air of optimism in Gulf Interstate's new five-story office building at 1125 Brazos St. in Houston. There seems no doubt in anyone's mind but what the pipeline system will be expanded in the near future. The most logical initial step would be to increase the compressor station horsepower. At a cost of between $25 and $30 million the capacity could be boosted to 565 MMcf daily. From that point on, further expansion would take the form of looping the mainline.

Gulf Interstate's strategic location astride the shortest route between major gas reserves and the nation's greatest fuel markets, its enviable financial picture, and its brilliant leadership combine to paint a bright picture of the company's future.

GAS staff report

Part 2

Gulf Interstate's stations are the ultimate in design for automatic and remote control

GULF Interstate Gas Co., the country's newest major gas transmission line, is just as modern in design, construction and operation as it is new. From the latest in electrical controls to the design of personnel houses that dot its compressor station sites, the line is an outstanding example of what can be done through the application of the most advanced techniques available to the pipeline engineer.

Those responsible for the Gulf Interstate project, along with many others of long experience in gas pipelining, have recently sensed a trend toward simplification and economy in the design and operation of pipelines of the future. Such an approach has been applied to all departments by the company's closely knit executive, operating and engineering staffs. Evidence of their thinking and what they have done about it is exemplified in every aspect of the Gulf Interstate design and operating practices.

On the operating level, for instance, a streamlined approach is taken with the use of district superintendents who have full charge over a specified section of the line. With the entire line divided into five districts, all with a single compressor station, each superintendent is responsible for both the compressor station operation and pipeline maintenance in his territory. The districts vary in size depending upon the physical requirements of the particular section of the line but average about 200 miles.

This operating pattern is also reflected in station facilities. Both pipeline and compressor personnel make use of the same machine shop, mobile

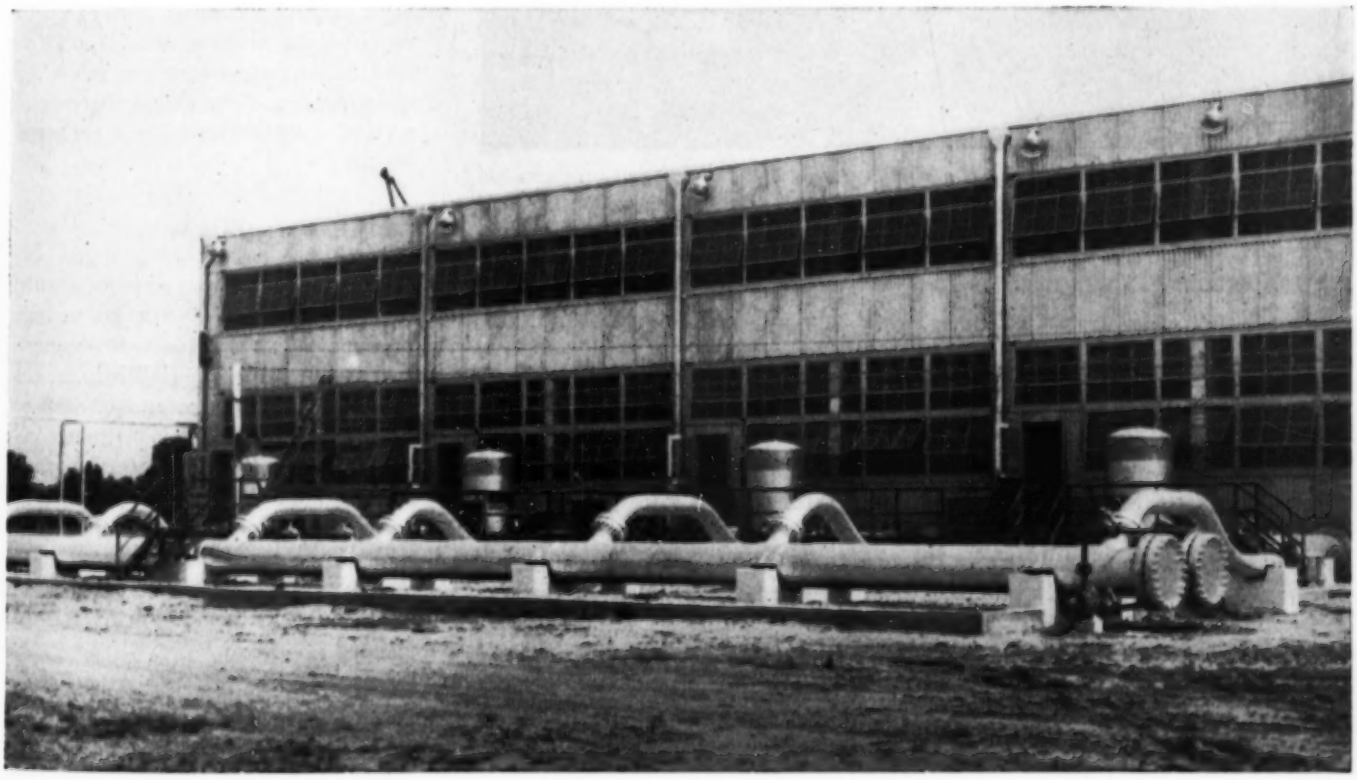


Fig. 1. Compressor station piping showing suction and discharge headers with air intake filters, one for each of the four compressor engines, in background.

ONE-MAN OPERATION IS POSSIBLE IN THE RECIPROCATING STATIONS

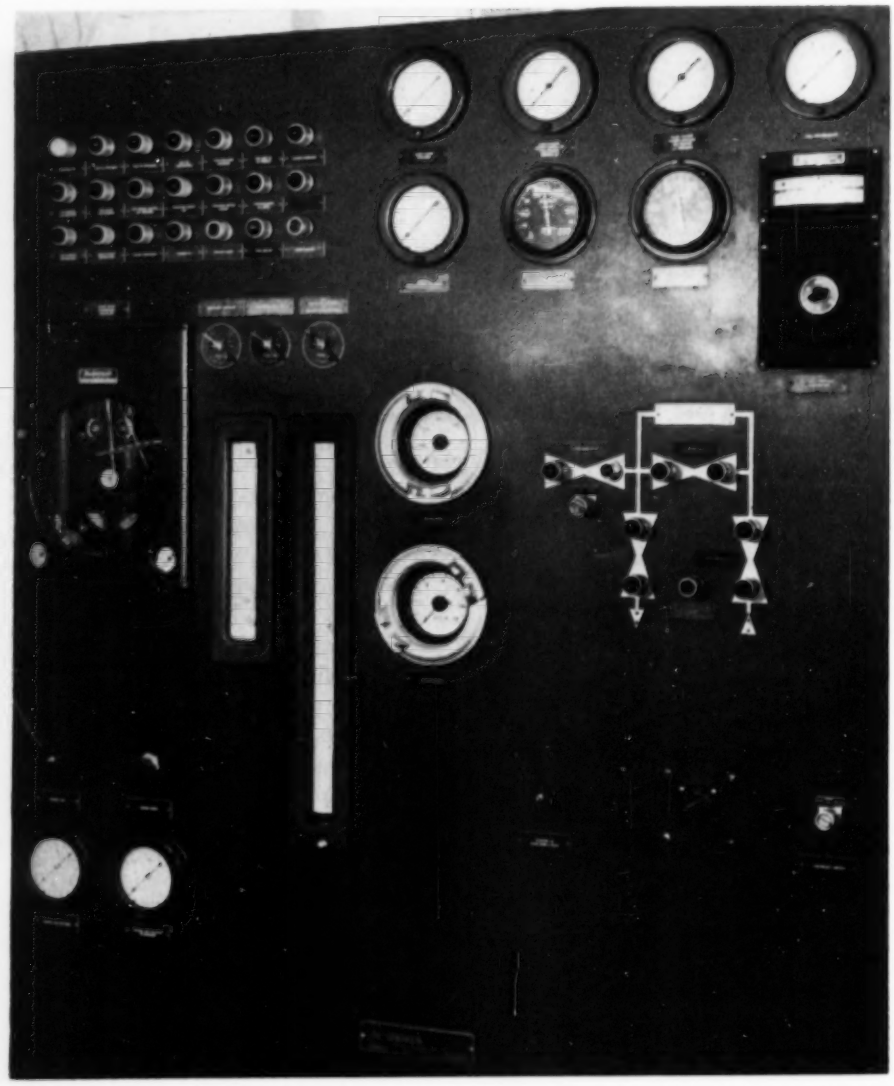


Fig. 2. Compressor engine control board showing warning lights at top, left, and graphic diagram of engine suction and discharge piping at center, right. Each of the station's four engines is controlled and monitored from one of these boards. The valves indicated in the graphic diagram are suction and discharge valves, bypass and blowdown valves.

equipment and other facilities attached to each of the districts. The practice makes for efficiency as well as economy.

Gulf Interstate has made provision for supervisory contact with the entire length of the line at all times by telephone and teletype communication as well as radio. A means for automatic reporting of line pressures and flows, as well as compressor engine operating conditions, to the company's Houston office at all times is provided by radio and leased wire facilities.

A policy of close personal contact between the Houston office and field personnel has also been established. To facilitate this program, landing strips have been built at each of the compressor stations for the use of company owned aircraft.

Nearly every aspect of Gulf Interstate's design has some unique feature that is worthy of mention. It has utilized a simple, economic and compact arrangement of the equipment necessary to perform the compression service and the pertinent auxiliary services required at each station. All station piping, except water lines and a few other miscellaneous services, is above ground. This practice facilitates inspection and repair, and serves to make expansion both convenient and economical.

Of particular interest is the fact that gas cleaners are located on the main transmission line, outside the station valves, rather than on the station piping as is usually the case. This feature permits gas cleaning to continue even though the station may be completely off the line. Aerotec, 200 MMcf dry type gas cleaners are used at each compressor station as well as at various locations on the gathering system.

Housing for safety

Housing for station personnel is equally unique. Modern houses, painted a variety of colors, are available to station supervisory personnel. The houses, built by Southern Mill & Manufacturing Co., are grouped together far enough away from the compressor building to assure safety and a minimum of disturbance from noise.

Of all the advanced techniques that have been incorporated in the design none exemplifies the Gulf Interstate approach more than does the semi-automatic control of the line's compressor engines. Many of the semi-automatic control, alarm and shutdown features which have been designed into the line's stations qualify under the recently coined description, "automation." Only the term is new to the staff of Gulf Interstate engineers who worked for many months in developing and proving the various semi-automatic control processes. The project required the widespread search for suitable sensing, control and operating equipment, and the fitting together of each of the parts into a final packaged design.

One-man operation

The Gulf Interstate stations are the first instance of reciprocating engines on a major gas pipeline to be designed for one-man operation. While the design is aimed at what might well be termed an automatic gas pipeline compressor station, it was not the intention of the system's engineers to develop an unattended station. In fact, the design provides for a station that is even more closely controlled than many of those now in use which are built for full manual operation.

The first consideration in any semi-automatic control system suitable for gas pipeline operation is a dependable automatic warning and safety shutdown circuit. This feature, along with centralized and automatic control of com-

Warning, control, and shutdown systems

Abnormal Engine Condition	Signal	Engine Reaction
1. Low oil pressure	Light, horn	Shutdown
2. High oil pressure	Light, horn	Shutdown
3. High oil temperature	Light, horn	Shutdown
4. High jacket water temperature	Light, horn	Shutdown
5. High exhaust temperature	Light, horn	Shutdown
6. Low exhaust temperature	Light, horn	
7. Low oil level in engine crankcase	Light, horn	
8. Low remote control air pressure	Light, horn	Shutdown
9. Overspeed of engines	Light, horn	Shutdown
10. High discharge gas pressure	Light, horn	Shutdown
11. Vibration of engine	Light, horn	Shutdown
12. Vibration of cooling fan	Light, horn	Shutdown
13. Fuel gas on	Light	
14. Ignition on	Light	
15. Controls on	Light	
16. Low water level in surge tank	Light	
17. Low starting air pressure	Light	
18. Air blower overloaded	Light	
19. Low control air pressure	Light	
20. Suction, discharge, bypass and blowdown valve in "Open," "Closed" or "Moving" position	Light	

pressor engines and other associated equipment, is the heart of the Gulf Interstate compressor station design. Every effort was made to apply automatic operation where possible and to minimize the human element in operation control. An equally important consideration is installation of complete monitoring facilities to enable both local personnel and engineering supervisors in the company's Houston office to maintain a close watch over all equipment.

Two manual operations

Only two basic manual operations are required to put the station on the line. Both of these can be done from the operating position at the station's control board. The first operation inaugurates the engine starting cycle and the second sets off a valve operating cycle which automatically loads the engine. The operator must, however, set a control panel switch for "automatic" before either of these cycles will start. It is also possible to make the valve operating cycle a part of the engine starting cycle to result in a single manual operation to put the engine on the line.

Each of the four compressor engines in a Gulf Interstate compressor station has a separate control board which is located adjacent to it *(Fig. 2, 3)*. In addition, the compressor station has one master control board which contains the indicating and recording equipment for all engines. The latter board is also located in the compressor engine building. When trouble develops at any one of the engines it shows up on the master control board. Control of each individual engine, however, is from the engine's own control board. All the control boards and other portions of the automatic control system were assembled by Nelson Electric Manufacturing Co. of Tulsa.

All relays and associated equipment used in the automatic control and shutdown circuit are located outside the compressor building in the space between the building and cooling fan housing structure.

Initial valve position for engine start up is with the engine suction and discharge valves closed, and the bypass valve between them open. Before the engine is started it is necessary for the operator to set a master control for "Automatic," which opens the discharge valve. To start the engine a start controller located on the engine control panel is operated. Starting air is applied to the engine until pressure in the scavenging air header has reached a prescribed value. At a predetermined scavenging air pressure a starting relay is energized which closes a circuit to the engine impulse generator, feeds fuel to the cylinders, and shuts off starting air. A needle valve diaphragm controller operating on scavenging air pressure regulates the amount of fuel to the engine during the starting cycle.

Valve cycle

Once the engine is idling properly the operator inaugurates the valve opening and closing cycle which starts the suction valve to open. When the suction valve is about half open the bypass valve between suction and discharge lines begins to close. As the suction valve passes through the last half of its opening cycle the bypass valve closes completely. During this cycle the engine automatically comes up to speed. In the case of the Gulf Interstate station at Rayne, La.—starting point for the

Fig. 3. Interior of one of the compressor buildings showing location of compressor engine control panels (right) adjacent to each of the engines.

ON STREAM, MONITORING SYSTEM TAKES OVER ENGINE CONTROL

mainline—there are a pair of suction lines to each engine, one from each of the two gathering laterals extending south from the station. The operator chooses from which of the two lines he wishes to take suction and the automatic equipment operates the proper valve.

Heart of the automatic valve operating sequence used on the engine start up and shutdown cycles are the Type E-I-M valve operators made by the E-I-M Co. of Houston *(Fig. 4)*. The 12-in. Nordstrom valves on engine suction and discharge lines as well as the 4-in. Nordstrom valve on the engine bypass line is E-I-M operated. A full sized mock-up of the individual engine starting panels and main building panels—including suction, discharge and bypass valve controls—was set up and operated before engineering was finalized.

Once the station is in operation and on stream an extensive system of monitoring and emergency warning and shutdown equipment takes over control of the engines. A signal will be actuated and the engine automatically shut down and taken off stream as indicated in the following chart.

For monitoring engine operating conditions the following gauge indicators are located on each of the control panels:

Gauge Indicators on Each Control Board

1. Jacket water pressure.
2. Remote control air pressure.
3. Starting air pressure.
4. Scavenger air pressure.
5. Exhaust pressure.
6. Fuel gas pressure.
7. Engine speed.
8. Lubrication oil cooling water temperature.
9. Lubrication oil cooling water pressure.
10. Lubrication oil temperature.
11. Exhaust manifold temperature.
12. Cylinder temperatures.
13. Crankcase pressure.
14. Control gas pressure.
15. Blower speed.
16. Suction gas pressure.
17. Discharge gas pressure.

For normal engine shutdown the master control switch is thrown from "Automatic" to "Off." This starts the shutdown cycle during which the engine fuel and ignition is turned off; the suction, discharge and bypass valves are operated in reverse of the starting cycle. With the master control switch in "Manual" position all controls can be overridden.

When the engine master control switch is in the "automatic" position a set of locked sequences are in effect to prevent the improper operation of certain functions. For instance, the compressor engine cannot be started with the discharge valve closed. Fuel gas cannot be fed to the engine unless the ignition is on, and ignition will not go off until after fuel gas has been turned off. The suction and bypass valves operate in a fixed sequence with the opening of one corresponding with the closing of the other.

Typical of specially designed automatic alarm and shutdown equipment is an instrument supplied by the Foxboro Co. for monitoring engine cylinder temperature. A Foxboro segmental chart Dynalog recorder is used to record the exhaust temperature of each of the cylinders on all four of the station's engines. In addition to this recording feature, the instrument contains a Rotax circuit, so that should any cylinder temperature go too low a signal will be energized at the particular engine. Should any cylinder temperature go too high, an alarm will be

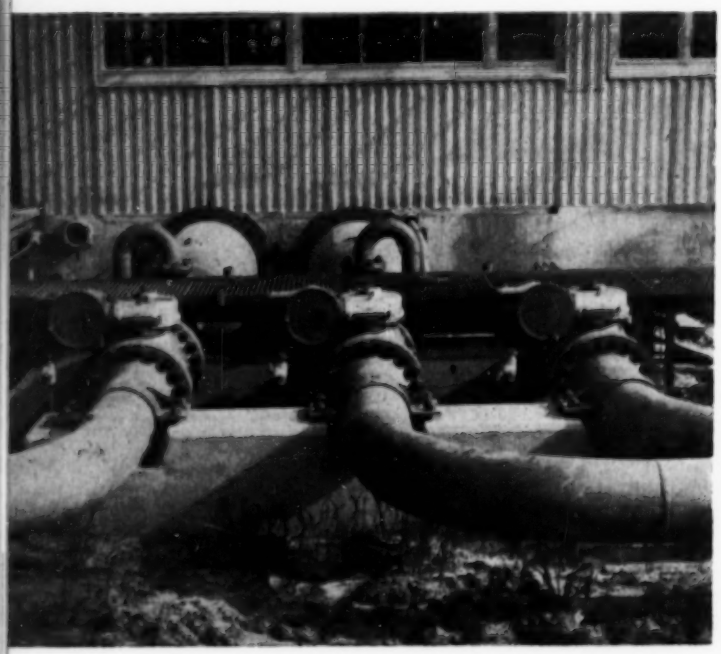
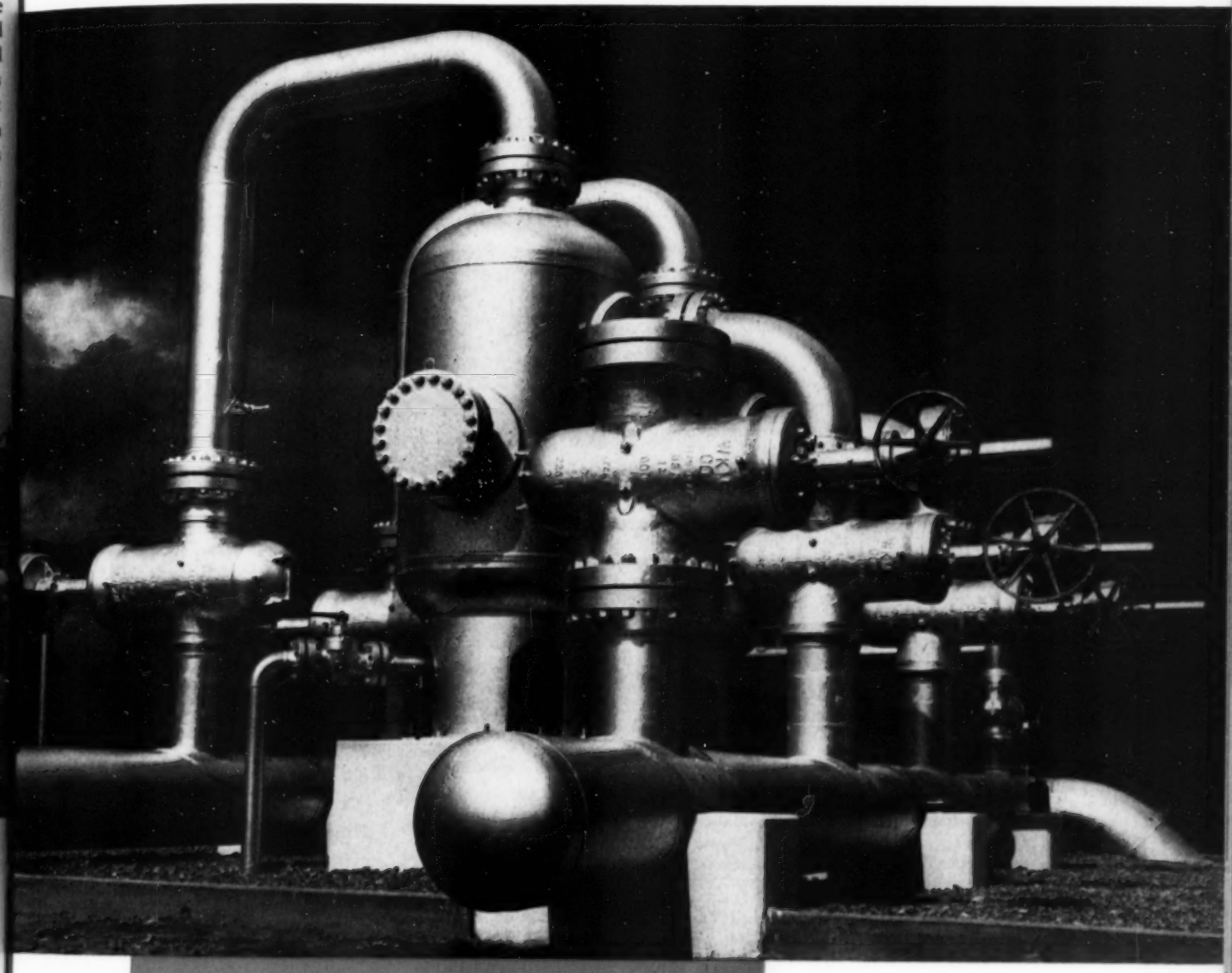


Fig. 4. Suction and discharge piping for one of four engines at Rayne compressor station. At this station two suction lines, one from each of the line's two southern laterals, are piped through to the compressor engine.

Fig. 5. A pair of gas cleaners located on the mainline at one of the compressor stations. The unique design has placed the cleaners on the mainline rather than adjacent to the compressor building.

Typical

. . . of pipeline installations all over the world is this view of W-K-M Through-Conduit Valves at a recently completed Gulf Interstate Gas Company Compressor Station. It is but one of five such stations in which W-K-M Valves are employed, in addition to the many larger W-K-M Valves used in the line itself.



Scrubber Installation, Delhi, La.

Most of the World's Most Modern Pipelines Are Tied Together with W-K-M Valves.

W-K-M Valves

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A DIGITAL APPROACH IS USED IN PRESSURE-RPM TELEMETERING

sounded at that engine and it will automatically be shut down.

Compressor engine speed, and suction and discharge pressures from any of the stations along the line may be telemetered into the Houston office over the company's Bell System VHF radio and leased line circuits. To get a reporting of these values from any station it is only necessary to dial a code number on an ordinary telephone dial in the Houston office. The reporting appears in the Houston office on a teletype machine.

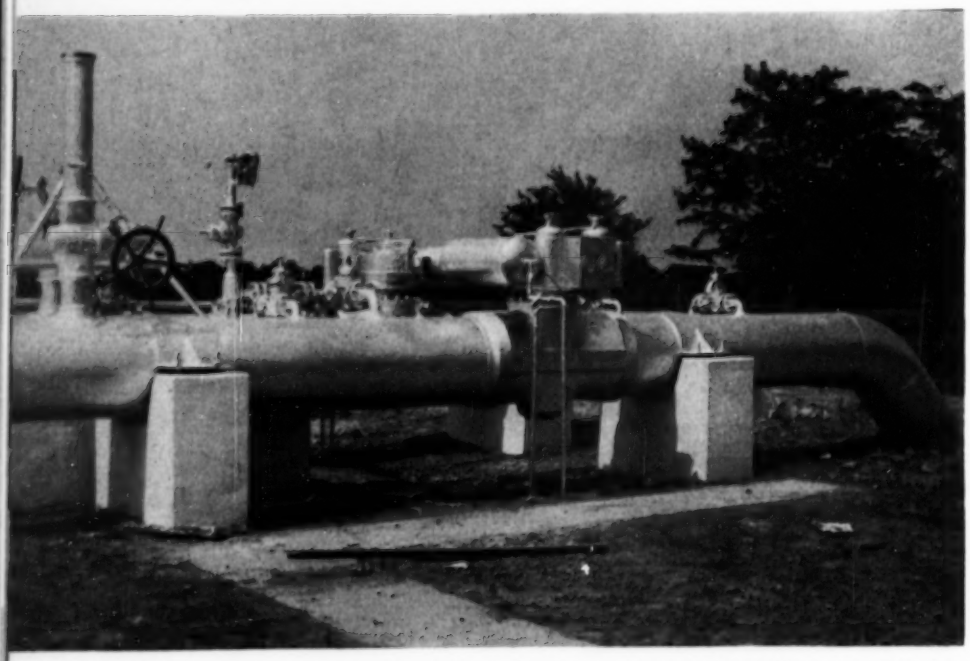


Fig. 6. Automatically operated station valves located on station piping at point where suction and discharge lines take off from mainline. At left is blowdown valve and stack.

Terminal equipment designed by Berkeley Div. of Beckman Instruments Inc. is used to pick up and transmit the information over the Bell System radio and wire circuits.

Digital approach

This complete electronic pressure-RPM telemetering system is the first time an almost complete digital approach has been used. The equipment is used to accomplish the following three major objectives:

1. To convert analog data such as static pressure, differential pressure, temperature, and speed into forms suitable for measurement.

2. To measure these converted quantities to a high degree of accuracy.

3. To translate these measurements into a suitable code for transmitting on an existing Bell System (60 speed) teletype circuit to one or several teletype on an "as-called-for" basis.

The emergency station shutdown system operates on compressed air. Four emergency shutdown valves, located at various places on the station grounds, are used for this purpose. The operation of any one of them will start the station shutdown cycle which includes closing valves, blowing down station piping and stopping all engines.

Integral parts of the shutdown system are the Shafer-operated Nordstrom 24-in. valves located at the point where station lines take off from the main transmission line, and the Garrett relief valve which has been converted to operate on either over pressure or on the station's emergency air pressure system. The Shafer vane-type operators are used in a conventional manner on an air pressurized system. Loss of pressure, created by the opening of any one of the emergency three-way shutdown valves, will start the station shutdown cycle by operating the Shafer to close the Nordstrom gate valves. The Shafer operators may also be used to manually operate the gate valves with a hydraulic pump that is a part of the controller.

Fuel shutoff

When any one of the emergency three-way shutdown valves is operated a Mercoid switch also opens the impulse generator circuit on each of the compressor engines and shuts off the engine's fuel supply. After the Shafer operators have closed the station valves —and not until after they have been closed—the station blowdown valve is automatically opened.

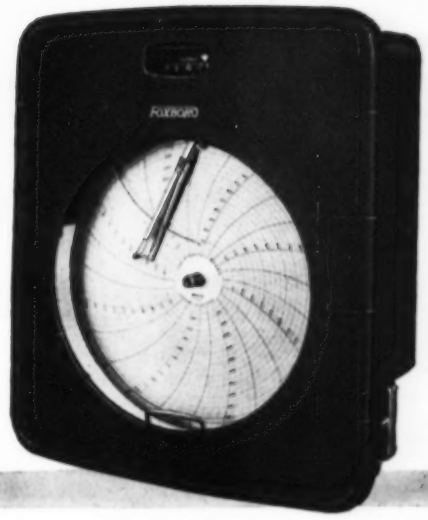
The blowdown system is unique in that Garrett relief valves have been converted to operate on either the emergency air pressure shutdown system or on over pressure. In addition to the relief valve which is located on the station's main discharge line, a Garrett relief valve is also located on the discharge lines from each of the compressors. These engine relief valves are also used as manual blowdown valves, being remotely operated from the engine control board. Engine piping is blown down into a 10-in. header buried underground and extending the full length of the compressor building.

Air supply

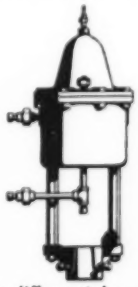
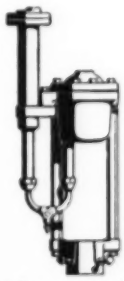
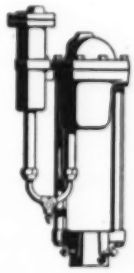
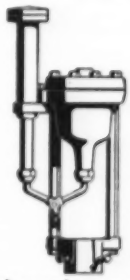
Two hundred and fifty pound starting air and emergency shutdown air is supplied from two Worthington air compressors located in the space between two of the station's cooling fans. Both compressors are normally driven from electric motors. However, one of these air compressors is so positioned that it can be driven from a Waukesha gas engine in case of electric power failure.

Station auxiliary power is derived from a pair of 125 kw generators driven by Waukesha engines.

What's worth metering is worth metering right!



. . . and Foxboro offers the *right* meter for any metering problem. Round and rectangular cases. Meter body types are shown below.

TYPE 22	TYPE 29	TYPE 27	TYPE 28	TYPE 26
				
light weight and low cost, preferred for portable recording, or with 6" indicator, for mounting directly on piping.	for differential ranges as low as 1" H_2O, especially for low pressure gas and air service.	superior general use meter with all Foxboro design features for high sustained accuracy and maintenance-freedom.	longer float travel, greater power, highest accuracy meter ever built.	leakproof measurement at really *high* pressures without compromise in accuracy.

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From its complete line of flow meters, Foxboro can offer the *best* type — in the proper range and static pressure rating — for virtually any metering problem. They are available as indicators, recorders, controllers, and transmitters — with or without integrator. Foxboro also is the maker of the d/p Cell — the compact force-balance type flow transmitter which uses no mercury.

The widest selection of flow instruments is only one of the many factors responsible for Foxboro's acknowledged leadership in flow metering. See how this factor — together with many superior, exclusive design features — give you the most value for your money. Write for Bulletin 460-2 on mercury meters, Bulletin 420-2 on d/p Cells.

Specifications of Foxboro Meter Types Illustrated

TYPE	MATERIAL	MAX. W. P.	RANGES
22	Forged Steel	2000	20"—200"
29	Cast Iron	150	1" —10"
27*	Forged Steel	2000	10"—400"
28	Forged Steel	2000	50"—400"
26	Forged Steel	5000	100"—400"

*Type 27U is a uniform flow scale meter used for steam and other service where demand fluctuates widely. 100" range. Max. W. P. 2000 psi.

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FOXBORO FLOW METERS

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FACTORIES IN THE UNITED STATES, CANADA, AND ENGLAND

GAS report

Part 3

Unitized design unique feature of compressor plant operation

KEY station on the southern end of Gulf Interstate's new line is located about six miles north of the town of Rayne, La., where easterly and westerly laterals from south Louisiana gathering fields meet to form the main 30-in. line north. Both east and west laterals are brought into Rayne station and appear as compressor engine suction headers. Valves on each of the lines between suction headers and compressors permit suction to be taken from either one or the other *(see Fig. 4)*. The two laterals are also connected together outside the station grounds and gas may be fed into either or both directly into the main north line. Valves on each of these lines permit the station to be bypassed.

When the station is put on stream, one or both of the 24-in. mainline valves are closed and Nordstrom 24-in., Shafer-operated valves located on the station lines adjacent to the mainline are opened to allow gas to enter the station suction headers and to be discharged into the line north.

Although compressors are permitted to take suction from one or both of the incoming suction headers, discharge from all engines is into a common discharge header. A 4-in. bypass line and valve is connected between the suction and discharge lines at each of the compressors. This valve is located just outside the compressor building along with a Garrett relief valve which is connected from the main engine discharge line into a common 10-in. blowdown line located below grade.

Because of the location of Rayne station at the junction point of the line's two gathering laterals, it has certain equipment not included in the other stations. For one thing, the station is equipped with a calorimeter which is used to alternately sample gas in the east and west laterals. It is also used on gas samples taken regularly from various purchase stations on the line's gathering system. The station is also equipped with a gravitometer and dew point measuring equipment which are used similarly.

Gas measuring points are located on each of the two laterals a few miles south of the Rayne station. A Commercial 20-in. Type CN full orifice fitting is used on the 20-in. west lateral and a type CS full fitting is used on the 24-in. east lateral. Commercial semi-full deadline orifice fittings ranging in size from 4-in. to 10-in. are used at all purchase points in south Louisiana.

The only other place where gas is measured is at the two delivery points on the north end of the line in Kentucky. Five 10-in. meter runs are used at Leach measuring station where gas is delivered to United Fuel Gas and at Means measuring station where gas is taken by Central Kentucky Natural Gas

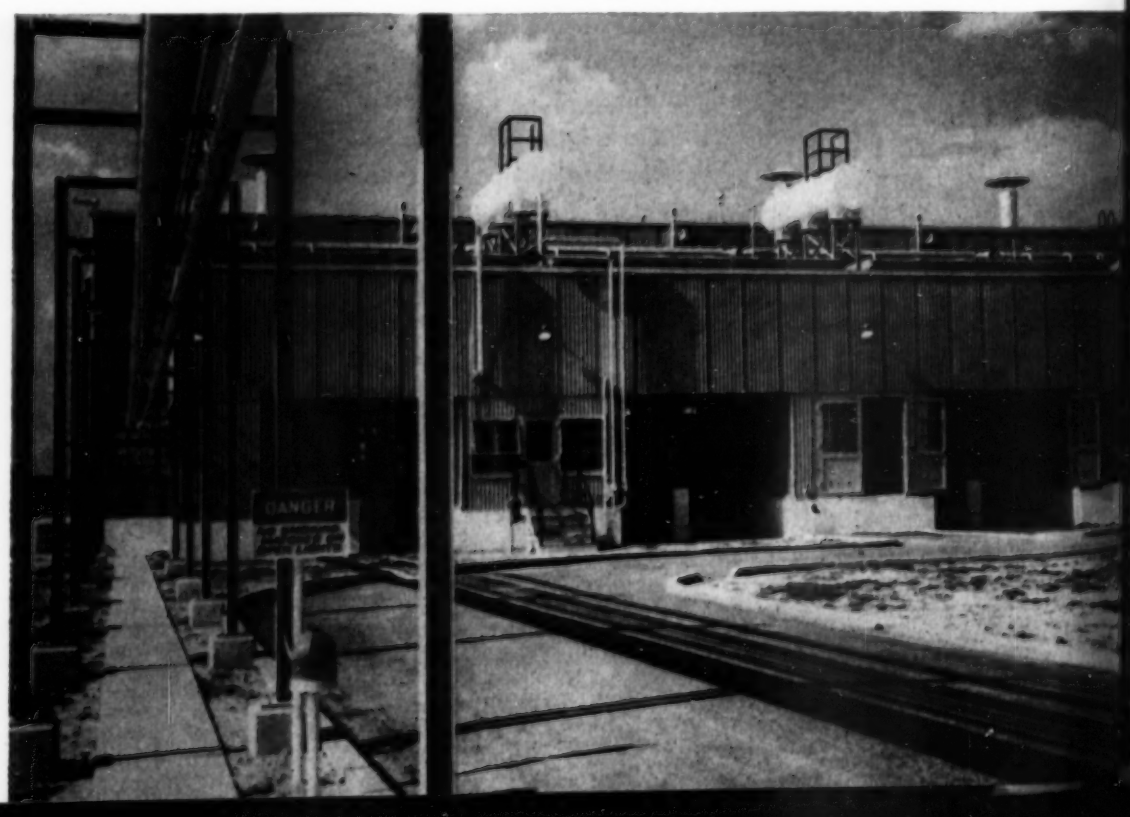


Fig. 1. View of annex building at Delhi compressor station showing openings where cooling fans for each of the station's four engines are located. Overhead piping at left is from auxiliary building.

VARIABLE-SPEED COUPLING RUNS COOLING FANS OFF ENGINES

Co. Commercial orifice fittings are also used at these stations.

Rayne compressor station is typical of the so-called "unitized" design used throughout the system. Basis of this design is the compact, integrated arrangement of the compressor engine and its appurtenant equipment.

The four compressor engines and control equipment are located in a single building. Cooling fans and coils for each of the engines form a smaller enclosure parallel and immediately adjacent to this building. Space between the fans and the smaller enclosure is used for various compressor engine auxiliary equipment. The space between the cooling fans associated with engines number one and two is used to house starting air compressors. The space between fans two and three houses water softening facilities, and that between fans three and four the engine fuel and regulating equipment.

This layout eliminates the need for separate buildings to house miscellaneous station equipment. The partially walled areas created by cooling fan and oil housing are enclosed for this purpose. The result is an economically built, compact structure which houses all the engine auxiliary equipment.

Coupling

Heart of the "unitized" arrangement is the hydraulic, variable speed control coupling between each of the compressor engines and its cooling fan *(Fig. 2)*. The cooling fan for each engine is driven from the main shaft of the engine through a hydraulic coupling device which will permit the speed of the fan to be automatically varied with engine heating. Although this arrangement aligns one fan with each engine, a system of common headers will permit a cross-connection of cooling facilities.

The hydraulic coupling is actuated by a diaphragm motor which is, in turn, controlled by the engine jacket water temperature. As the jacket water temperature rises a Honeywell diaphragm motor operates an oil scoop inside the coupling which causes the speed of the fan to increase. As the temperature decreases the opposite action takes place and the fan operates at a lower speed. Fan speed can vary between zero and about 265 rpm depending upon engine cooling requirements.

This feature permits the engine jacket water to be maintained at a constant temperature which closely follows the cooling requirements of the engine. Unnecessary cooling at startup and during cold weather is eliminated. Operation of the hydraulic speed controller is used in conjunction with the closed re-circulation of jacket water during warmup periods.

The design calculations are based on summer conditions of 100° F atmospheric air temperature. The jacket water heat load is taken at 2500 Btu per hp hr, and the oil heat load at 500 Btu per hp hr.

The fan drive shaft is located below the engine room floor. The fan is driven through a belt and pulley arrangement from the engine main shaft. On the fan end of the drive shaft a right angle speed reducer is used to drive the fan which is horizontally mounted in conventional manner. Each of the fan units is equipped with five Joseph A. Coy cooling coils; three for engine jacket water and two for oil cooling water. Surge tanks for oil cooling water and jacket water are located on the roof of the fan structure.

Through the use of common jacket water and oil cooling water headers it is possible for one engine to pump water for others in the station. Four of these headers—one for hot jacket water, one for hot oil cooling water, one for cold jacket water and one for cold oil cooling water—are located between the compressor engine building and the fan housing structure.

Additional common headers for cold jacket water and cold oil cooling water are located inside the compressor building and permit the re-circulation of water during warmup periods and at other times when outside cooling is not required. A diaphragm operated, three-way valve, controlled from a thermocouple in the engine jacket water bypasses cooling water around the coils when cooling is not required. In all instances the water pump is located in the hot water line.

Cooling control

Two different methods are used for controlling the cooling of engine lubricating oil. In the stations powered by Clark engines the lubricating oil bypasses the water jacket heat exchanger

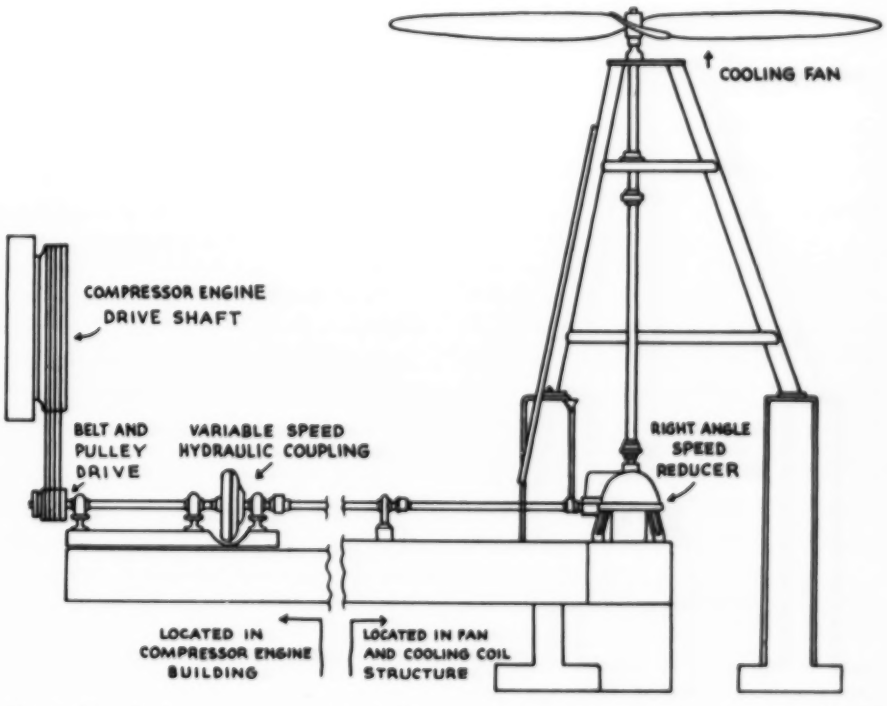

COOLING FAN
COMPRESSOR ENGINE DRIVE SHAFT
BELT AND PULLEY DRIVE
VARIABLE SPEED HYDRAULIC COUPLING
RIGHT ANGLE SPEED REDUCER
LOCATED IN COMPRESSOR ENGINE BUILDING
LOCATED IN FAN AND COOLING COIL STRUCTURE

Fig. 2. Sketch showing manner in which compressor engine main drive is hydraulically coupled to cooling fan.

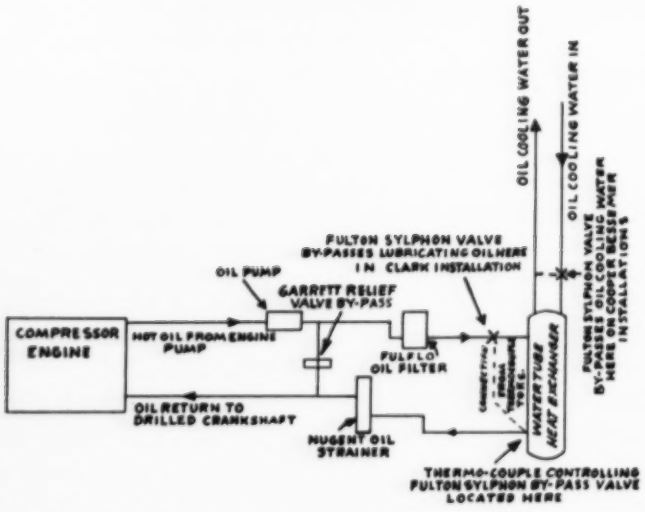

OIL COOLING WATER OUT
OIL COOLING WATER IN
FULTON SYLPHON VALVE BY-PASSES LUBRICATING OIL HERE IN CLARK INSTALLATION
OIL PUMP
GARRETT RELIEF VALVE BY-PASS
COMPRESSOR ENGINE
HOT OIL FROM ENGINE PUMP
FULFLO OIL FILTER
WATER TUBE HEAT EXCHANGER
OIL RETURN TO DRILLED CRANKSHAFT
NUGENT OIL STRAINER
THERMO-COUPLE CONTROLLING FULTON SYLPHON BY-PASS VALVE LOCATED HERE

Fig. 3. Flow diagram showing two different methods used to control the cooling of lubricating oil.

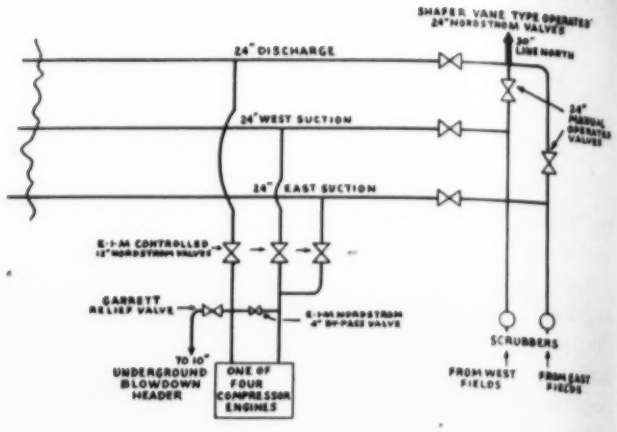


Fig. 4. Station piping at Rayne compressor station showing how suction lines from east and west laterals are piped through to each of the station's compressor engines.

TWO DIFFERENT METHODS CONTROL DEGREE OF COOLING IN SYSTEM

when cooling is not required. On the Cooper-Bessemer installations the oil cooling water bypasses the heat exchanger when cooling is not required. On the Clark installations, where oil bypasses the heat exchanger, the oil cooling water is continually circulated through the water jacket heat exchanger, whereas on Cooper-Bessemer installations, where water is bypassed, the engine lubricating oil is constantly circulated through the exchanger.

A typical flow diagram, pointing out the two different methods of controlling the degree of cooling, is shown in *Fig. 3.*

Flow

Normal flow is from the engine to a Commercial Fulflo oil filter, through a heat exchanger and back to the engine's drilled crankshaft through a Nugent oil strainer. On the Clark installations a Fulton Sylphon temperature controlled bypass valve is located in the engine hot oil line ahead of the heat exchanger. The valve bypasses oil around the heat exchanger when cooling is not required.

A Garrett relief valve located on a bypass line between the oil pump outlet and the oil inlet to the engine permits the engine lubricating oil to bypass the entire external system and flow from the pump directly back to the engine's drilled crankshaft if trouble should develop in the external oil lines or any of the external components. Bypass valves are also located in the system around each of the component parts to permit their removal for repair or replacement.

High on the list of new compressor station design features is the suction and discharge pulsation dampening system. Considerable work was done by Gulf Interstate engineers in an effort to remove noise and troublesome vibration and, at the same time, to minimize the loss in pressure that accompanies the functioning of dampeners. The Gulf Interstate "series type" design develops a pressure drop of about 0.1% of discharge pressure at 935 psi for a flow of 125 MMcf. The suction dampening bottles are designed for the same approximate efficiency in pressure drop. Older type pulsation dampeners had pressure drops of the order of 1.0%.

The series type dampeners make use of the ratio between the area of the bottle and the interconnecting lines to produce a high degree of dampening. In installing the system the conventional compressor engine discharge bottle was replaced with a set of two bottles which have no orifice plates or baffles. The only pressure drops are in the interconnecting pipes and in the sudden enlargements and contractions in the bottles. A swedge is used at the bottle outlet and inlet to reduce some of these sudden changes in area and minimize the resultant pressure drops.

In the practical design of the dampening system a strain gauge transducer, electronic amplifier and oscillograph were used with an experimental compressor engine to study the pulsation patterns developed in the suction and discharge piping. Tests were made at a great many engine speeds, pressures and flow rates. The resultant design has permitted a reduction in pulsation level at the output of the dampener from about 30 psi, peak to peak fluctuation, to between 3 and 4 psi, peak to peak.

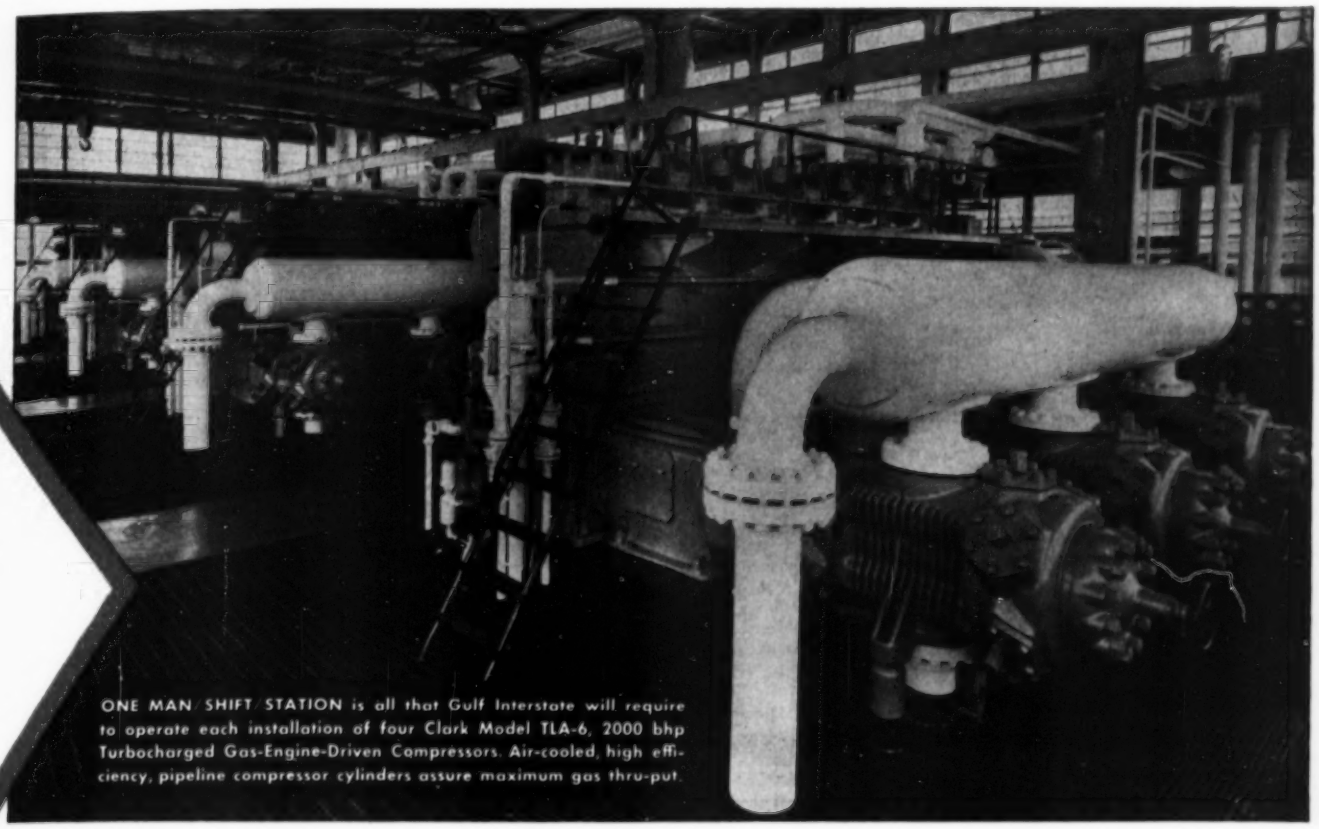
Air cleaners

A design to increase effective horsepower and conserve space was incorporated in air cleaning equipment for the Gulf Interstate compressor stations. The air cleaners were particularly designed for low pressure drop and compactness. At those stations using Clark HLA8 turbo-supercharged engines a vertically mounted outdoor air cleaner is used along with an in-line silencer, both made by Burgess-Manning Co. The Cooper-Bessemer GMW8 installations use a specially designed Burgess-Manning air cleaner-silencer for direct mounting on the engine.

Exhaust snubbers for all stations are the new Burgess-Manning type BES. The snubbers are mounted horizontally on the roof of the compressor building, directly above the compressor engine for easy accessibility. The exhaust piping is equipped with rupture disks at the end of each straight run. The snubber is explosion resistant.

NEW GULF INTERSTATE SYSTEM

Selects the Clark Turbocharged Model TLA-6 for its Automatic, Push-Button Operated Stations



ONE MAN / SHIFT / STATION is all that Gulf Interstate will require to operate each installation of four Clark Model TLA-6, 2000 bhp Turbocharged Gas-Engine-Driven Compressors. Air-cooled, high efficiency, pipeline compressor cylinders assure maximum gas thru-put.

It's already an accepted fact that the Gulf Interstate Gas Company has changed the pattern for natural gas transmission with its one man, push-button controlled, automatic compressor stations.

With such advanced thinking, it's only natural that Gulf Interstate will be the first to use the NEW Clark Model TLA, 2000 bhp, Turbocharged Compressors in conjunction with their newly developed system of controls.

Gulf Interstate's control devices for automatic operation of these Clark Compressors did not appreciably increase the installed cost.

If you're interested in a compressor station that can be operated with the highest possible efficiency — *automatically* — while still maintaining station-loading flexibility, be sure you investigate Clark Models TRA and TLA Compressors. There are 8 sizes in a range of 825-3300 bhp. Ask your nearest Clark representative for Bulletins 130 and 134.

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- 25-30% lower installation cost.
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- Generous temporary overload capacity.
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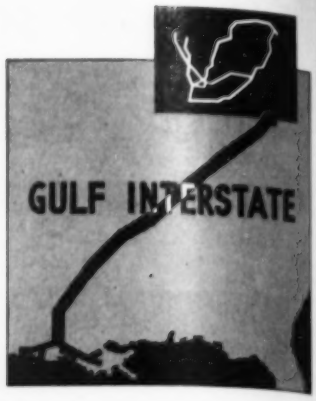
- Low cycle temperatures for maximum cylinder and ring life.
- Only one turbocharger per unit.
- Unapproached for accessibility.
- 2-cycle simplicity, dependability.

CLARK compressors

Clark sets the pace in compressor progress

Part 4

New construction ideas used in river crossings and testing



GAS staff report

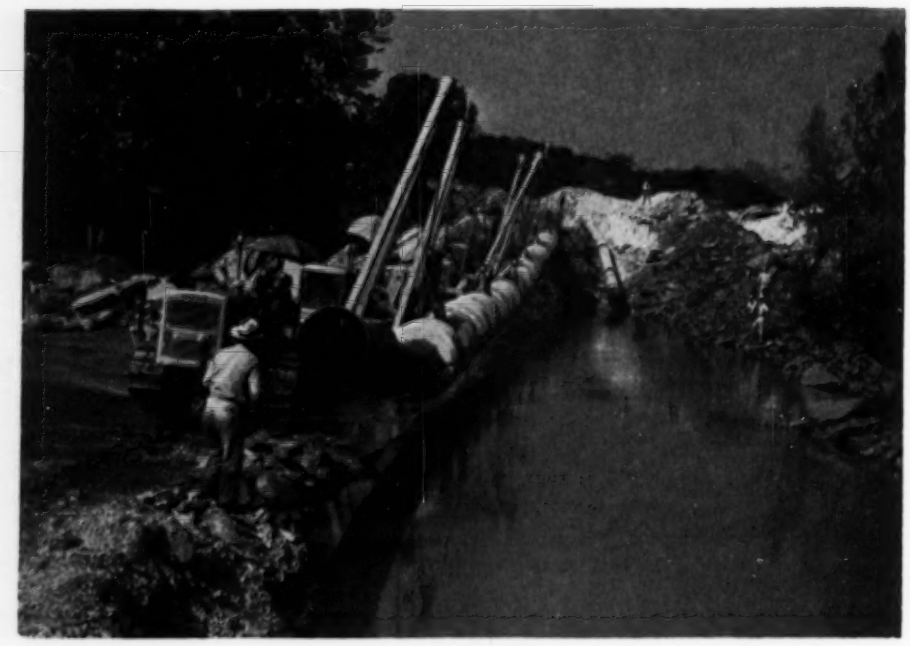


Fig. 1. Section of the 30-in. line weighted with concrete river weights is lowered into the water at one of the line's river crossings.

METHODS used in the construction of the Gulf Interstate line were equally as modern and unique as the line's compressor station design and operating procedures. From the original survey through the final cleaning and testing of the line, the most advanced construction practices were used.

Houston Contracting Co. built that portion of the 30-in. mainline from Rayne, La., where the two laterals meet to form the mainline north to the vicinity of Hampshire, Tenn. H. C. Price Co. built the remaining portion of the 30-in. mainline from the vicinity of Hampshire, Tenn., to the line's terminus on the Big Sandy river near Catlettsburg, Ky.

Portions of both east and west laterals immediately south of Rayne, La., and connecting gathering lines were laid by Anderson Brothers Contracting Co. This included 20-in. and 24-in. line from the vicinity of Lake Arthur to a point near Jefferson Island, La. Associated Pipeline Contractors Inc. built the remaining part of the west lateral consisting of 12-in. and 16-in. lines and related gathering lines from the vicinity of Lake Arthur southwest to the vicinity of Cameron, La. The 20-in., 12-in. and 8-in. west lateral, and gathering lines, were built by Williams Brothers Contracting Co. from a point near Jefferson Island to the vicinity of Bourg and Valentine, La.

Crossings of the Kentucky, Cumberland and Tennessee rivers were made by Missouri Dredging Co. J. Ray McDermott Co. contracted for the crossings of the Red and Ouachita rivers, and the outstanding Mississippi river crossing. Max Lake Outlet and Atchafalaya river was crossed by Williams Brothers Co.

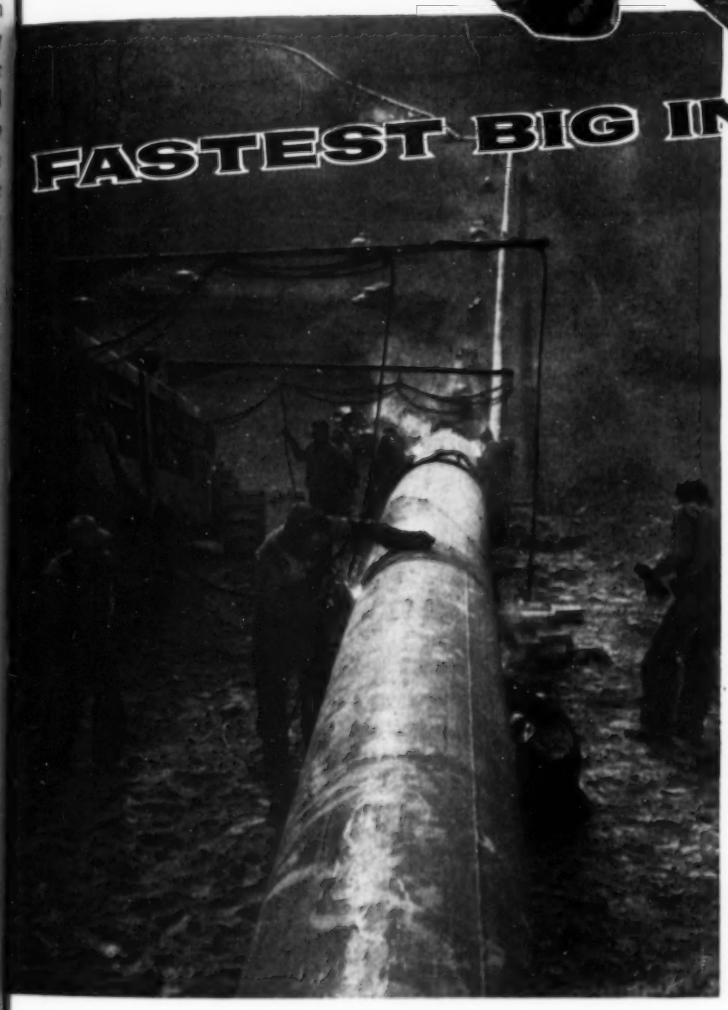
The line's crossing of the meandering Mississippi river, always a major job, was undertaken with the same forward approach that has characterized the whole Gulf Interstate project. The original routing of the line permitted a crossing at any point along about a 30-mile length of the river south of the Louisiana-Arkansas border. Three possible crossing sites were found within this distance. However, one of them was rejected because of the instability of the river's east bank and another was rejected because of a potential scouring action that was building up just upstream of the site. The third site was selected because of its favorable scour depth and the apparent stability of the banks, one of which was aided by a clay plug.

As an additional protection to the line from any bank cutting, an entirely new and different method of crossing design was used. Instead of laying the multiple crossing in a single or adjacent ditches, the lines were spread to prevent the possibility of bank cutting taking the entire line out of operation. The procedure resulted in what amounted to two separate crossings separated by at least 1000 ft (see *Fig. 2*). The main 30-in. line was divided into two lines on each bank of the river, back of the levee with a single 24-in. header. Each of these lines extended nearly to the river bank line where they were divided into two crossing lines, one a 16-in. pipe and the other a 24-in. pipe. Valves are located in both lines on each side of the river.

Approximately 8,525,000 cu yd of silt, sand, clay and gravel was removed with hydraulic cutterhead dredges for the four line trenches across the river. These dredges, capable of excavating 60 to 75 ft below the water surface, dug the trenches well below the scour depth of the river.

The crossings were made with API

FASTEST BIG INCH EVER BUILT



IN the building of Gulf Interstate Gas Company's new 30" transmission through the mountains and rocky hills of Tennessee and Kentucky, the construction record speaks for itself . . . . . .

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H. C. **PRICE** CO.
CONSTRUCTORS

BARTLESVILLE, OKLAHOMA

America's Foremost Pipeline Constructors

HYDROSTATIC TESTING, COATING AND WEIGHTING WERE YARD JOBS

5LX seamless pipe. The 24-in. lines had a wall thickness of ½ in. and weighed 125.4 lb per linear ft. The lines were triple welded to make 120-ft lengths and laid from a ramp barge.

Before the pipe left the yard a protective coating was applied, it was weighted and hydrostatically tested to 1250 psi. The coating was made up of pipeline primer, a 3/32-in. thick coating of hot pipeline enamel, a glass fiber wrap, a second coating of hot enamel and then a 15-lb asbestos felt paper wrap. All lines were concrete over the protective coating.

The concrete coating was reinforced with steel bars placed horizontally and circumferentially and followed with a layer of 12-gauge wire mesh. Total thickness of the coating on the 24-in. line was 3½ in. Resultant weight was 450 lb per linear ft for the 24-in. line.

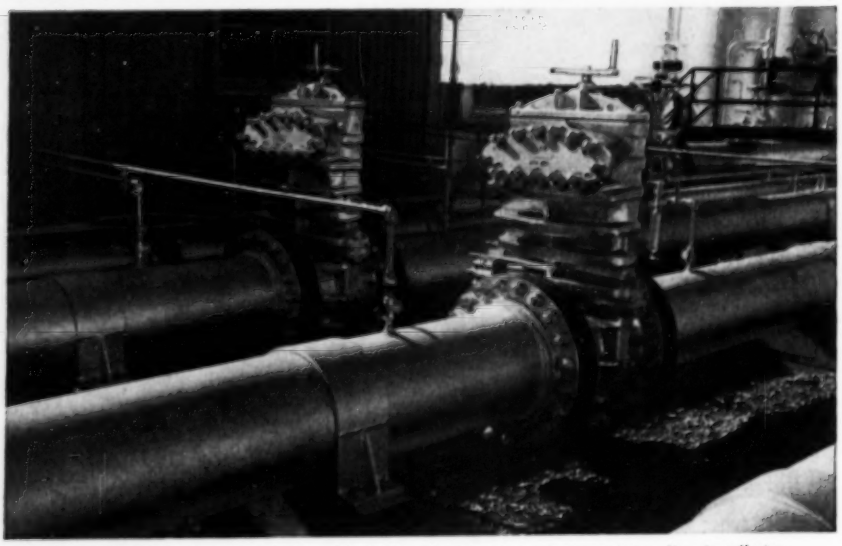
Prime contractor on the Mississippi river crossing was J. Ray McDermott Co. of Harvey, La. Dredging was done by McWilliams Dredging Co. of New Orleans, and land lines were installed by Associated Pipeline Contractors Inc. of Houston.

Concrete river weights for the south Louisiana portion of the line and for river crossings and river bottoms along the remainder of the route were made up by Rosson-Richards Construction Co. in portable fabricating units which followed line construction. A total of 5674 30-in. bolt and nut type weights, totaling 6400 lb each, were made up by four Rosson-Richards rigs which operated from Cicily Island, La., to Glasgow, Ky.

After the concrete weights were poured and cured they were stacked and left to be picked up by the laying contractor. The portable rig was then moved on to another location along the line ahead of the laying contractor.

One of the most outstanding techniques used during the construction phase was the method of air cleaning and testing the line. Of particular interest are the reasons why air, rather than gas or water, was used for the

COMMERCIAL ORIFICE FITTINGS



Two 16" 300-lb. Commercial Type CN Orifice Fittings on a gas transmission line installation.

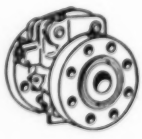
Commercial Orifice Fittings were chosen by Gulf Interstate Gas Company for controlled metering on gas transmission and gathering lines. Installations include Type CN, Type CS and Type DPL Orifice Fittings. Commercial Orifice Fittings are designed for one-man operation; size and pressure determine mechanical construction for safe and easy control. Why not make your selection from the wide range of Commercial Orifice Fittings?

Type CS Chambered

Two chambered types are available: Type CN, shown in photo above, in sizes from 2" to 20", 125 lb. to 2500 lb. ASA. Larger sizes are furnished with swinging chamber, designated Type CS.

Deadline Fittings are available in sizes from 2" to 24", 125 lb. to 2500 lb. ASA. High-pressure fittings have pin-locked covers; those for lower pressures are stud-bolted. Larger sizes of both types have geared covers for safe operation.

For more detailed information, see your Composite or Refinery Catalog, or call your nearest representative.



Type DPL Deadline

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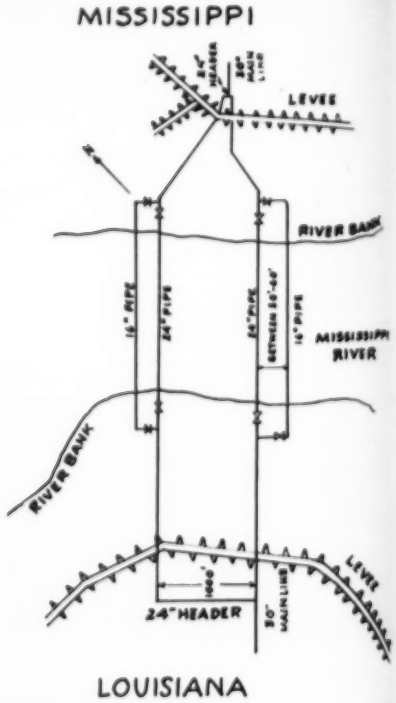

Fig. 2. Diagram of the line's Mississippi river crossing showing spacing of 16-in. and 24-in. pipe for a new design in multiple crossings.

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Wherever you go, you'll find Republic Line Pipe—Electric Fusion Weld, Electric Resistance Weld, or Continuous Butt Weld. This time, it's Republic Electric Fusion Weld Line Pipe, shown being installed in the section of Gulf Interstate Gas Company's 30-inch line through Tennessee and Kentucky.

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CONTINUOUS BUTT WELD

Other Republic Products include Casing and Tubing — Steel and Plastic Pipe — Studs, Bolts and Nuts — Heat Exchanger Tubes — Steel Buildings

Fig. 3. A battery of six mobile compressors (background) on location during air cleaning and testing operation on the Gulf Interstate mainline. Manifolding for tieing compressors into line are shown in foreground.

CLEANING AND TESTING WERE SYNCHRONIZED WITH JOB PROGRESS

testing operation. For one thing, air is cheaper than gas, and air testing eliminates the difficult water removal job required in hydrostatic testing. Also, by using air the cleaning and testing program could be initiated immediately behind construction crews to eliminate the delay normally required to put the line into service when other methods are used. Finally, air is considerably safer than gas for testing purposes and affords a greater degree of reliability.

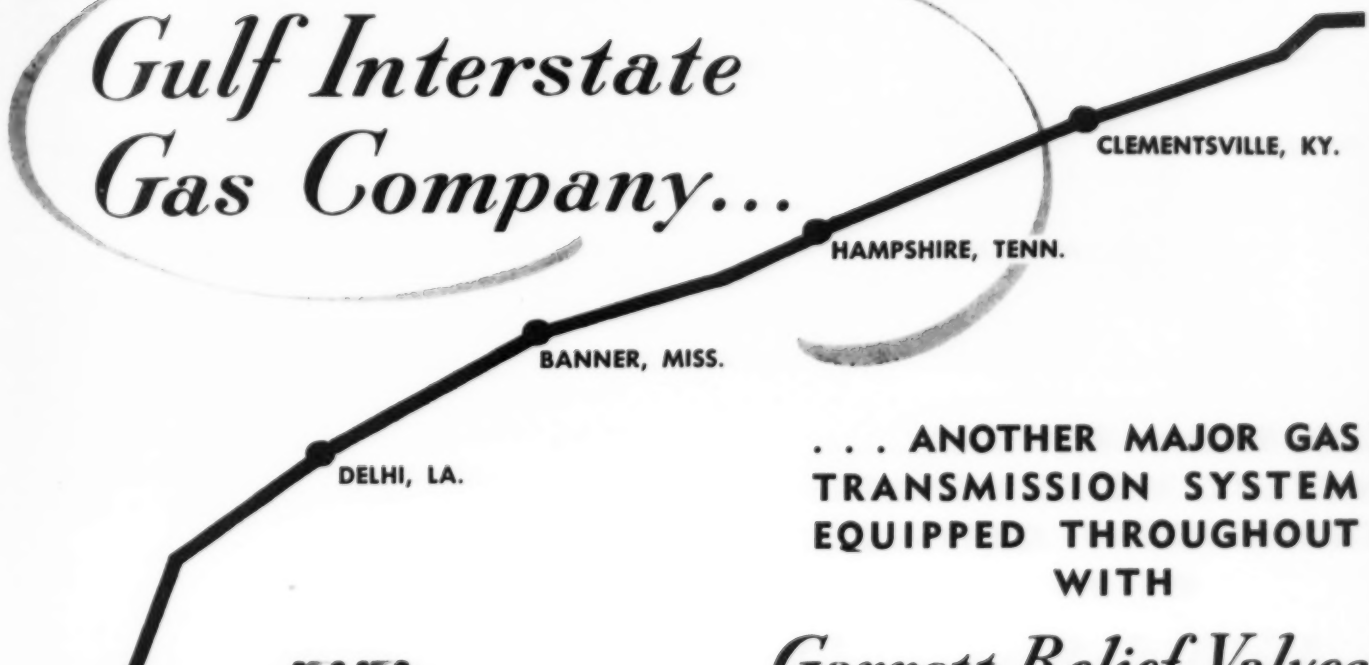
Before the operation got underway details of the process were carefully worked out. It was deemed essential to integrate the cleaning and testing program with the progress of line construction and to devise an operation that would conserve and make use of air pressure built up as it progressed.

Two complete testing crews were outfitted for the job. One of the crews was assigned to test the north half of the line and the other the south half of the line. Each crew consisted of 22 men equipped with the necessary compressors, trucks, welding gear and miscellaneous equipment to carry out the entire operation.

Chicago-Pneumatic, diesel driven PO-8 and PO-400 air compressors were chosen for the job because they offered the degree of portability and flexibility required by the operation. These units provided the additional features of four-state compression with inter- and

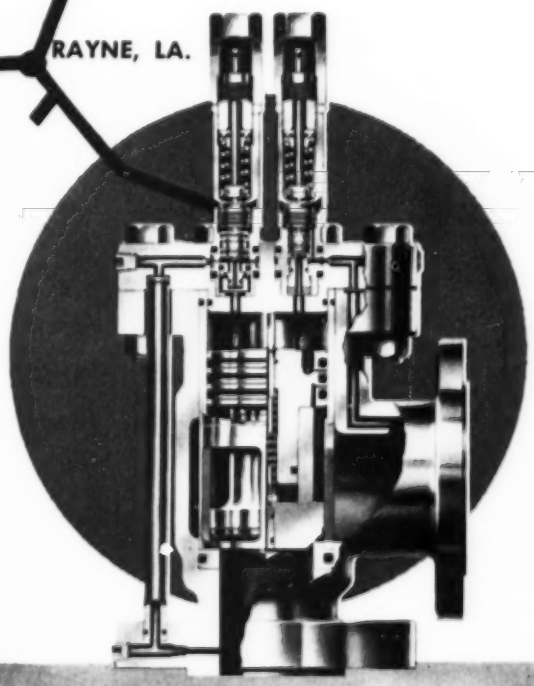
Fig. 4. Trucks loaded with line pipe for Gulf Interstate shown near Gadsden, Ala. Parkhill Truck Co. used a total of some 150 trucks in transporting pipe to construction sites from mills as far away as 450 miles.

Gulf Interstate Gas Company...



. . . ANOTHER MAJOR GAS TRANSMISSION SYSTEM EQUIPPED THROUGHOUT WITH

Garrett Relief Valves



Guardianship of this immense new system is a great honor . . . and a responsibility which Garrett Relief Valves are designed to discharge with precision and efficiency.

Safeguarding the system against all dangers of overpressure, they provide high relieving capacity, with full orifice opening at selected set pressure without a percent accumulation of overpressure; they will relieve, blow down and re-seat within extremely close limits, and will maintain accuracy of set pressure and re-set pressure over unlimited cycles. Add to these their wide operating ranges, easy field maintenance and long life and it becomes easy to understand why Garrett Relief Valves merit the confidence of gas transmission companies the world over. Two other features . . . soft seats capable of withstanding high pressures, and full adaptability to remote controls . . . were important factors in their selection for the Gulf Interstate system.

Garrett Relief Valves are available in sizes and types to handle gas or liquid pressures from 10 to 3000 psi. Full information will be furnished upon request.

Garrett Oil Tools, Inc.

P. O. BOX 2427 • LONGVIEW, TEXAS

One of five compressor stations in the Gulf Interstate Gas Company system, all of which are equipped throughout with Garrett Relief Valves.

VITAL STATISTICS ON MATERIALS AND SPEEDS ON INTERSTATE LINE

(Story continued on page 164)

Pipe tonnage

Mainline	264,319 tons
Lateral lines	42,122 tons
River crossings:	
Kentucky	65 tons
Cumberland	188 tons
Tennessee	234 tons
Mississippi	2,224 tons
Ouachita	160 tons
Red	350 tons
	309,662 tons

Cubic yards of dirt moved in

	Est. Cu Yd
Mainline ditching only	5,703,000
Lateral and gathering lines	1,133,000
Mississippi river (four lines)	8,525,000
Others including minor river crossings	3,826,000
	19,187,000 cu yd

Material other than pipe totals (estimated)

Enamel	19,642 tons
Primer	61,759 gal.
Felt	19,505,700 sq ft
Fibre glass wrap	38,009,600 sq ft
Kraft paper	24,246,900 sq ft
River weights (all sizes)	5,757
Concrete supports and anchor blocks	3,324 cu yd

Number of welds (estimated)

Total in.	14,407,092
Total ft	1,200,591
Total ft of film (X-ray and gamma ray)	276,000 (approx.)

Number of creek, highway and railway crossings

Creek crossings	47 (requiring permits)
Highway crossings	282 state highways
Railway crossings	62

Specialized equipment used

Helicopters—for surveying and line scouting.
Egg beater ditching machine—in marsh areas.
Compound air and water jet trenching machine—in open water areas.
Air driven internal beveling machine—used to eliminate transmission sleeves.

Laying rates

30-in. mainline	
H. C. Price Co. overall average	0.80 mile per day per spread
Houston Contracting Co.	1.13 miles per day per spread
Overall mainline total	0.97 mile per day per spread
Lateral (typical spreads)	
20-in. pipe	0.87 mile per day per spread
24-in. pipe	1.12 miles per day per spread
16-in. pipe in swamp and marsh land	0.41 mile per day per spread
16-in. pipe on dry land	0.55 mile per day per spread
12-in. pipe in swamp and marsh land	0.66 mile per day per spread
12-in. pipe on dry land	0.98 mile per day per spread

Total number of valve settings in mainline

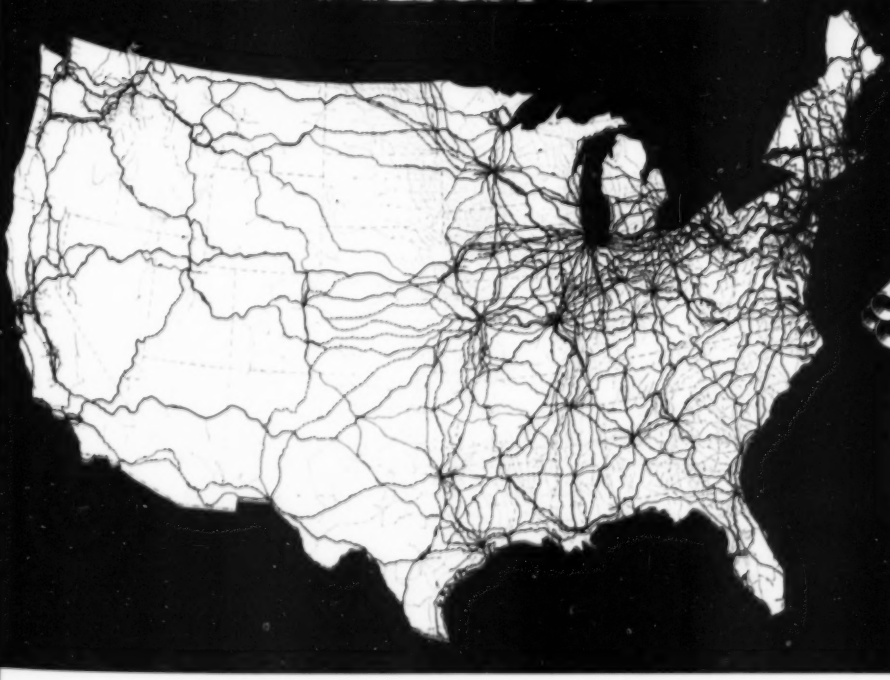
20-in. gate valves	66

Line Pipe Delivery

J&L PIPE

J&L STEEL

By Water



J&L PIPE

J&L STEEL

By Rail

450 MMCF OF AIR USED IN TESTING 850 MILES OF LINE

after-coolers which would eliminate excessive temperatures and permit more economical use of available horsepower.

Three PO-8's and six PO-400's were furnished to each of the two crews to provide the calculated 800-hp that would be required to compress the amount of air necessary to clean and test about 425 miles of mainline. Of the PO-400's there were three 3¼-in. by 5½-in. and three 1 15/16-in. by 5½-in. units.

Each of the cleaning and testing crews "kicked off" its operation at a base station located at a gate valve between two completed sections of line. The testing and cleaning was done in about 12-mile sections between gate valves, which were installed along with the operation. The crews followed construction by at least two sections.

The nine compressors which made up one working unit were manifolded together in such a manner as to permit them to operate either in parallel or series. They were used in parallel to gain volume as the air was being pumped from atmospheric pressure to about 150 lb. As the pressure was increased to above this value the units were connected in series to gain higher pressures.

The testing operation got underway by building up about 650-lb pressure in the section of the line on one side or the other of the gate valve at the base station. Once this pressure was built up a portion of the air was used to clear the section of line on the opposite side of the gate valve. This process equalized the pressure in both sections of the line.

Following this the pressure was built up to about 650 lb in the cleaned section of the line and a portion of this air used to clean the first section pressurized. Afterwards, both sections were individually tested to between 1000 and 1050 psig for the high pressure test. Maximum operating pressures will not exceed 935 psig at any point along the mainline.

Once the initial two sections were cleaned and tested the program continued according to a fixed plan. With a test pressure of about 1050 lb in the last section tested, about 200 lb was bled into the adjacent downstream section. This section was then deadweighted and the right-of-way carefully walked and inspected for leaks. During this inspection process the compressor units continued to pump into the tested upstream section where pressure had been reduced to about 850 lb. As soon as the inspection was completed the two sections were equalized bringing them to about 525 lb.

At this point in the operation the six PO-400 compressors were transported downstream to the next gate valve. The three PO-8 units remained at the base station. Three of the PO-400's (the 1 15/16-in. by 5½-in. units) were used to take suction from the upstream side of the valve at the new location for pressurizing the new section. When suction pressure dropped below 475 lb the remaining three PO-400's (the 3¼-in. by 5½-in. units) were placed in series to give additional compression.

It was found that the suction pressure could be dissipated to about 100 lb before it was necessary to build up capacity from atmosphere with the three PO-8's at the base station. In practice, during the testing of a complete 200-mile division of the line, the three PO-8's maintained about 150 lb in the line at all times.

At some point between 600 and 800 lb the new section of line was cleaned. This operation made use of a pig-launching device designed to release two pig cleaners and one squeegee or one pig cleaner and three squeegees in succession at predetermined time intervals without the loss of pressure. It was estimated that between 2.4 MMcf and 3 MMcf of air was required to clean each section of pipe. Approximately 450 MMcf of air at atmospheric pressure was required for the entire 850 miles of the line.

Once the line was cleaned the final step was the high pressure test. Deadweight indicators were located at each end of the section under test and the pressure was brought up to 1050 psig. With no leaks reported the entire cycle was repeated on the next adjacent section of line.

A central control board of pressure gauges and thermometers was located at the compressor site for accurate reading of test temperatures and pressures.

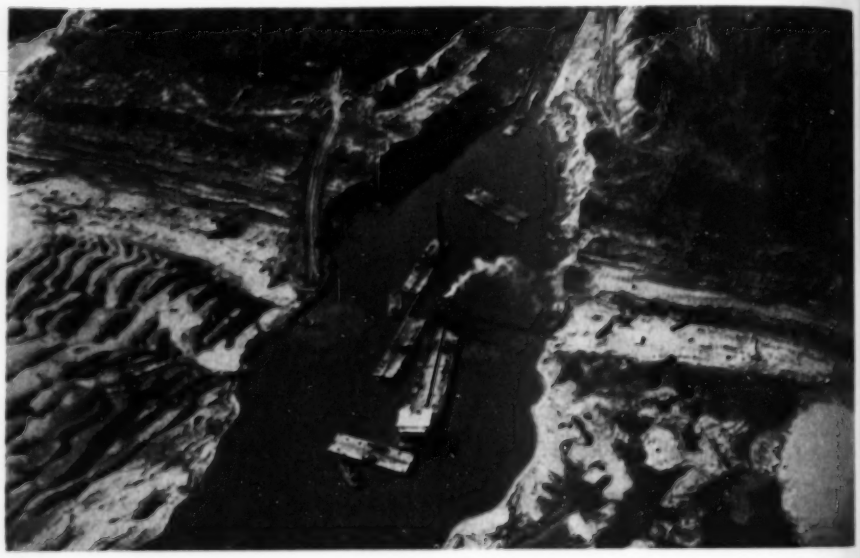
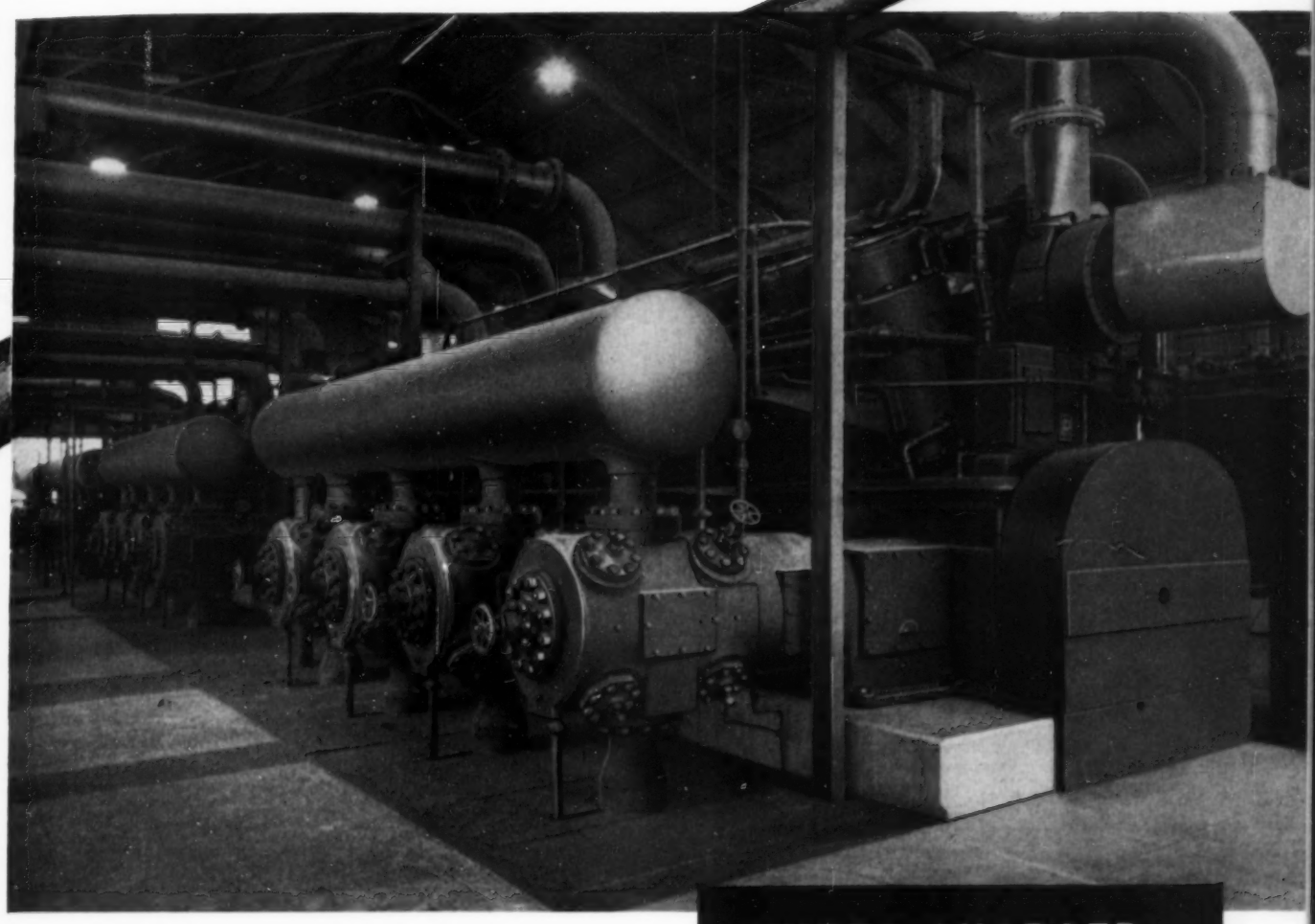


Fig. 5. Aerial view showing the bank cut at the line's multiple crossing of the Mississippi river between Louisiana and Mississippi.

Control of the suction and discharge pressures at the mainline was handled similarly with gauges and deadweight control tied into the mainline with ½-in. pipe.

To expedite the testing operation all road crossings were hydrostatically tested prior to the air test by Williams Pressure Service. This process not only served to make the testing conform with regulations established by the pending revision of the Code for Pressure Piping, but also made the final testing more safe.

for PIPE LINES



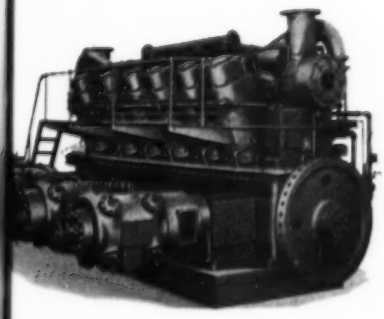
Seven Ingersoll-Rand 2000-hp KVS gas-engine-driven compressors at a natural gas pipe-line station in the Southwest—one of the first large-scale installations of the new Turbocharged unit.

TURBO-CHARGED

The KVS *Turbocharged* gas-engine-driven compressor gives Ingersoll-Rand a complete line of heavy-duty 4-cycle units from 110 to 2000-hp. In the 2000-hp KVS engine, dual exhaust-driven turbo-blowers provide intake air pressure for both scavenging and supercharging. Savings in space, weight, fuel and cooling equipment make this an important addition to the I-R line of V-angle, 4-cycle gas engines.

Whatever your pipe-line compressor requirements, Ingersoll-Rand can meet them from a *standard line*—with complete flexibility of compressor cylinder design and arrangement. With each size and type you get the traditional I-R *dependability* that means greater economies on a long-range basis. When planning *your* next installation, be sure to consult your Ingersoll-Rand representative. He can be of great help to you.

Application



KVS 2000 hp—Turbocharged
has 12 V-angle power cylinders and four compressor frames.

6-75

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

In Canada refer to

Canadian Ingersoll-Rand Company, Limited

800 Birks Bldg., Phillips Square Montreal 2, Quebec

CALGARY • KIRKLAND LAKE • NELSON • SHERBROOKE • SYDNEY • TIMMINS
TORONTO • VANCOUVER • WINNIPEG

6-month approvals total $324 million

The facilities authorized by the Federal Power Commission during the first six months of '54 had a total estimated cost of approximately $324.5 million, and will add almost 1.5 billion cu ft of daily delivery capacity to the nation's individual transmission system, FPC Chairman Jerome K. Kuykendall has pointed out. The new facilities will include about 4500 miles of pipeline.

Major projects—those estimated to cost $700,000 or more each—accounted for most of the total construction cost. These larger projects are expected to benefit some 56 cities of 50,000 population or over in 14 states and the District of Columbia, as well as numerous smaller communities. The larger projects will increase the daily delivery capacity of the individual transmission systems involved by more than 1.3 billion feet of natural gas per day. They involve construction of approximately 3440 miles of new pipelines and installation of compressor facilities aggregating more than 138,000 hp.

During the six-month period, the largest single authorization was to Pacific Northwest Pipeline Corp., Houston, to build its $160 million natural gas transmission system for new markets in Idaho, Oregon, Washington, Wyoming, Colorado and Utah.

The FPC, during the fiscal year ended June 30, 1954, the first full year of real Republican domination, authorized construction of a total of 6405 miles of pipelines and installation of compressor units aggregating 251, 540 hp at a total estimated cost of more than a half billion dollars. For the 12-month period, major projects costing $700,000 or more had a total estimated construction cost of $467.7 million, and included 6004 miles of pipeline and 233,980 hp in compressor units. They will add more than 1¾ billion cu ft of daily delivery capacity to the nation's individual pipeline systems.

Since Feb. 7, 1952 the FPC has authorized construction and operation of a total of more than 59,000 miles of pipeline and almost 4.2 million hp in compressor units. Total estimated cost of the facilities authorized over this 12½ year period is $4,387,000,000, and the projects are designed to add about 22 billion cu ft of daily delivery capacity to the individual pipeline systems in the U. S.

SUMMARY OF NATURAL GAS CERTIFICATES ISSUED BY THE FEDERAL POWER COMMISSION FEB. 7, 1942 - JUNE 30, 1954

Certificates	Total Miles of Lines	Total Add'l Comp. hp	Estimated Cost
Feb. 7 - June 30, 1942			
1	20	—	$ 86,800
July 1, 1942 - June 30, 1943			
4	51	3,560	1,642,509
July 1, 1943 - June 30, 1944			
25	2,373	108,490	106,082,485
July 1, 1944 - June 30, 1945			
43	1,181	66,610	34,170,760
July 1, 1945 - June 30, 1946			
52	2,994	184,275	127,189,731
July 1, 1946 - June 30, 1947			
132	5,369	360,349	273,190,302
July 1, 1947 - June 30, 1948			
98	8,468	371,310	519,945,633
July 1, 1948 - June 30, 1949			
91	7,045	436,274	566,203,116
July 1, 1949 - June 30, 1950			
108	6,188	493,340	487,240,014
July 1, 1950 - June 30, 1951			
173	8,695	736,135	725,432,984
July 1, 1951 - June 30, 1952			
136	3,378	539,510	321,919,895
July 1, 1952 - June 30, 1953			
133	7,123	582,715	723,037,744
July 1, 1953 - June 30, 1954			
165	6,405	251,540	500,881,248*

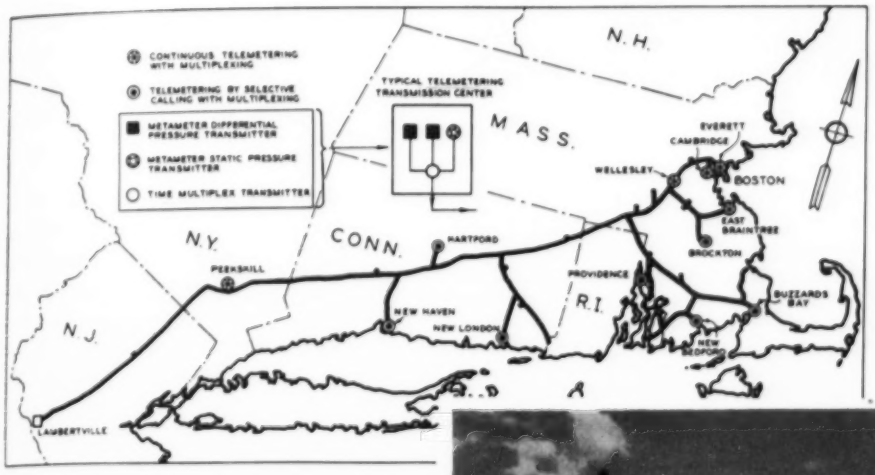
*During this 12-month period projects costing $700,000 or more each accounted for the following: certificates, 36; miles, 6,004; additional compressor horsepower, 233,980; estimated cost, $467,722,687.

CONSTRUCTION JOBS APPROVED BY FPC — JANUARY TO JUNE 1954

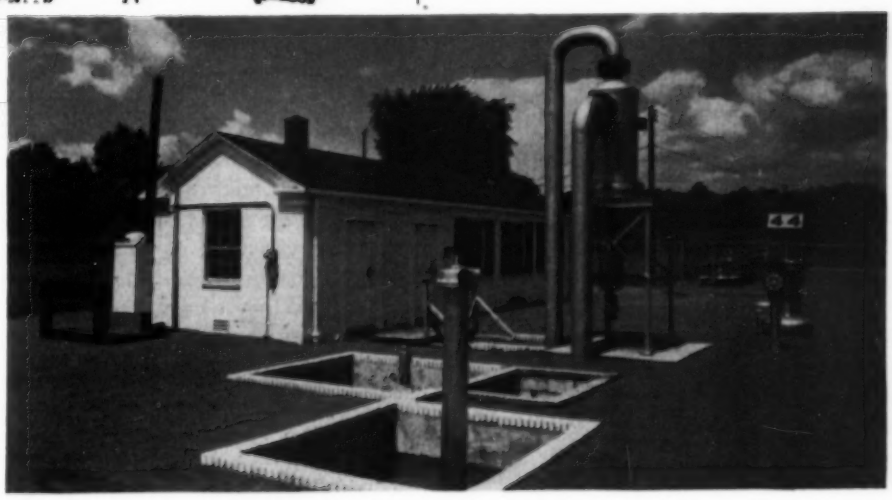
Applicant and Docket No.	Description and Purpose	Estimated Cost	Communities Benefitted (50,000 or more population)
Northern Natural Gas Co. G-2063-B March 11 (2063-A Issued) May 1, 1953	204 miles of 24- and 30-in. mainline loops, 935 miles of laterals, lateral loops and replacements in size from 2- to 24-in. and 22,800 hp in new and existing compressor stations on systems between Texas and Minnesota to enable it to receive 100 MMcf a day from Permian Basin Pipeline Co. and transport it to meet increased requirements of existing customers.	$ 45,037,557	Iowa—Des Moines, Sioux City, Waterloo. Minnesota—Minneapolis, St. Paul. Nebraska—Lincoln, Omaha.
Manufacturers Light and Heat Co. G-2192 March 26	13 miles of 20-in. loops, 21 miles of 16-in° connecting line to new storage field (Victory), 38 miles of miscellaneous 4- to 16-in. storage field lines and a 1780 hp storage field compressor station all in West Virginia, to develop a new storage field in West Virginia and receive an additional 73 MMcf.	3,747,446	New York—Buffalo, Binghamton. Pennsylvania—Erie, Pittsburgh, Allentown, Bethlehem, Harrisburg, Reading, York. West Virginia—Charleston, Huntington, Wheeling.
United Fuel Gas Co. & Central Kentucky Natural Gas Co. G-2194 March 26	58 miles of 30-in. transmission lines and a 6000 hp compressor station from a connection with Gulf Interstate in Kentucky to Lanham, West Virginia, and 1 mile of 20-in. line connecting to Lanham compressor station, to receive for the Columbia System 375 MMcf a day transported by Gulf and deliver it to other Columbia System companies a portion of which will also increase service to United's existing markets.	9,114,222	District of Columbia—Washington. Kentucky—Covington, Lexington. Maryland—Baltimore, Silver Spring. New York—Buffalo, Binghamton. Ohio — Cincinnati, Columbus, Dayton, Hamilton, Springfield, Toledo. Pennsylvania—Erie, Pittsburgh, Allentown, Bethlehem, Harrisburg, Reading, York. Virginia — Arlington, Norfolk, Portsmouth, Richmond. West Virginia—Charleston, Huntington, Wheeling.
United Fuel Gas Co. G-2285 March 26	4400 hp compressor station in Storage Pool X-59, Jackson county, W. Va., to better utilize X-59 storage field by enlarging facilities for input and withdrawal.	2,240,000	Same as above.
Atlantic Seaboard Corp. & Virginia Gas Transmission Corp. G-2286 March 26	117 miles of 26-in. loops in seven sections on mainline between Cobb, W. Va. and Baltimore, Md., and 4400 hp in new and existing stations, to receive additional gas from United Fuel and increase system capacity by 86.4 MMcf a day to meet increased demands of existing markets.	14,619,300	District of Columbia—Washington. Maryland—Baltimore, Silver Spring. Virginia — Arlington, Norfolk, Portsmouth, Richmond.

Continued on page 172

System - wide telemetering aids Algonquin Gas operations



This dual system provides the dispatcher with a running check on temperatures and pressures at outlying points, and permits shifting of loads quickly by remote control. The Wellesley regulator station shown below (Fig. 1), is typical of those throughout the system (see map, left).



By R. J. DUNBAR
Algonquin Gas Transmission Co.
Boston
and
WALTER RUFLETH
The Bristol Co.
Waterbury, Conn.

GAS exclusive

WHEN the question of telemetering arises in the initial discussion of a gas transmission system, the expense involved in an extensive installation must be justified from a number or respects. Certainly no company is going to make the heavy expenditure of capital required for system-wide telemetering unless it will fully justify its use. Such justification need not be on purely economic grounds, although admittedly these are probably the most important. Other aspects, such as efficiency and ease of operation, maintenance of confidence and good relations with customer utilities, and often simply keeping the system in operation can be reason enough for complete telemetering coverage.

The telemetering system installed by the Algonquin Gas Transmission Co. has proved its worth in a number of different ways. Probably its most important function in present and future operations is its use in transferring gas from one customer to another, enabling Algonquin to sell the maximum amount of gas possible while still staying within its assigned limits. There are many periods when one customer utility is not using its contracted amount of gas while another would be happy to use an extra volume if it were available. Without the continuous supervision that system-wide telemetering makes possible, there would be no way the supplier could allow the second customer to take more gas without risking heavy penalty charges. In Algonquin's

PART 1. Why the company decided upon telemetering

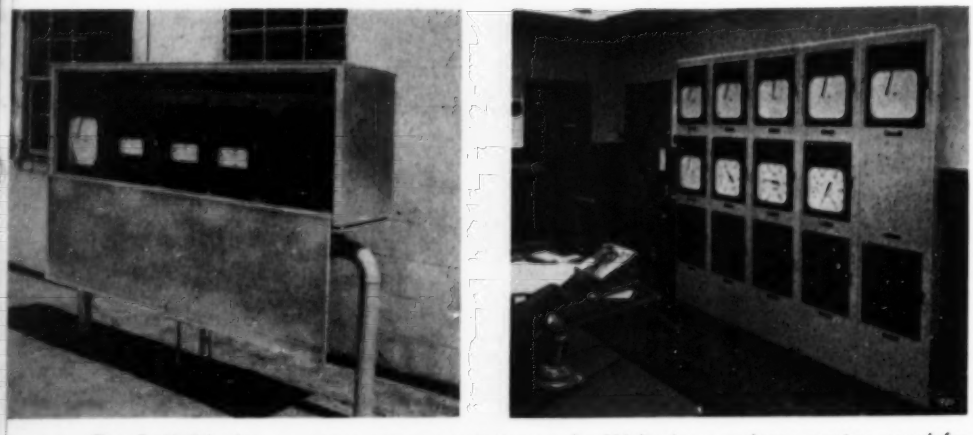


Fig. 2 (left) shows metameter transmitters at the Wellesley regulator station, used for measuring the temperature and pressure of gas at the station. The instrument at the right is a Time-Multiplex transmitter, used to reduce the number of transmission circuits needed to carry the information back to the dispatch office. **Fig. 3 (right)** shows the instrument panel at the dispatching office. The metameter telemeter recorders shown are continuously receiving information on twelve measurements of static and differential pressures in the Boston area. The indicators are used in selective calling to check conditions at outlying stations in Massachusetts and Connecticut.

operations, if New Bedford, Mass., for example, wants 5 million cubic feet more, it is a simple matter for the dispatcher to check pressure and flow conditions of the main line at Wellesley, and the conditions at New Bedford. From these figures he can quickly determine whether supplying the extra gas will cause hardship to any other customer. If not, the net sales of the company go up, while it stays within its assigned limits.

Other benefits

Also, many of the local utilities have industrial customers who are willing to take dump loads of gas at off-peak prices. When the dispatcher notices that demand is slackening, he can notify his customers of the situation and thus maintain his take at a more uniform rate.

A related benefit of telemetering is found in winter operations. When severe weather conditions are forecast, the dispatcher is able to pack his lines to their maximum safe limit by increasing his take slightly (staying below penalty levels) and then drawing on line storage to get through the heavy load period. Naturally there may be exceptionally severe periods when the only solution is "penalty" gas, but with judicious use of the information available, many of the otherwise disrupting cold snaps of winter operation can be nullified.

When Algonquin began operation last fall, both it and its customers started on a five year expansion plan, and each customer utility was queried as to its expected load at the end of the five years. The total combined loads made up Algonquin's own anticipated load. The first year, each customer was to take a percentage of its anticipated fifth year load and the take was to be increased each year until, at the end of the five years, the full quota was being used. Algonquin's contract with its supplier, Texas Eastern Transmission Corp., was set up on the same basis. The centralized record keeping which telemetering facilitates makes it possible to check readily on the relationship between anticipated demand and actual load conditions.

Operational value

Telemetering has proved its value in operational as well as economic aspects. At the time of initial operation, it was necessary that pressures at selected points on the system be maintained. Stationing personnel at each of these points would have resulted in high costs whereas the facilities of telemetering offered the feasible answer to the procurement of this operational information successfully and at moderate costs.

A somewhat unexpected benefit which has resulted from the telemetering system has been its help in detecting freeze-ups and obstructions in the line. By comparing the pressure at the main line tap with that at an end-of-the-lateral metering station, the dispatcher can tell when an obstruction is forming. An excessive pressure drop between the two points indicates ice in the line. With such indication, the dispatcher can send out a line crew to the area to break up the obstruction with alcohol injections, or other methods, before service is seriously curtailed or discontinued. Also, having telemetering from the extremities of the laterals enables the dispatcher to operate the system at lower pressures, thus reducing the danger of freezing.

Damage prevented

A specific case of freeze-up which was detected, and subsequent damage prevented through advance knowledge, occurred shortly after the system was first placed in service. The transmitter at the Wellesley regulator station, which is a two-stage pressure reduction station with primary and secondary regulators in parallel, showed an unexpected and unexplained pressure drop of about seven psi after which the pressure remained steady. A man was sent out to investigate and on arrival found that the supply pressure line to the controller on the primary had frozen, shutting the regulator. The secondary regulator opened and was carrying the load, but its supply line was also in the process of freezing. Were it not for the rapid remedial action based on the telemetered information, the system would have shut down with possible curtailment of gas to one of the biggest customers of the system. Since that time, filters and driers have been installed to prevent freezing in the instrument lines, but the incident still stands out in our minds as tangible evidense of the operational value of the telemetering system we had installed.

A gas transmission company, in order to operate in a stable, efficient manner, must have the confidence of its customers. To achieve this, it is essential that the company supply gas to each customer at the pressure which the customer has determined is best for his own operations. In addition, the gas should be available at all times with an absolute minimum of service discontinuities. It takes years of reliable and dependable service to build confidence in your customers, and we feel that telemetering is one of the means of guaranteeing satisfactory service at all times through adequate information of conditions on the pipeline system.

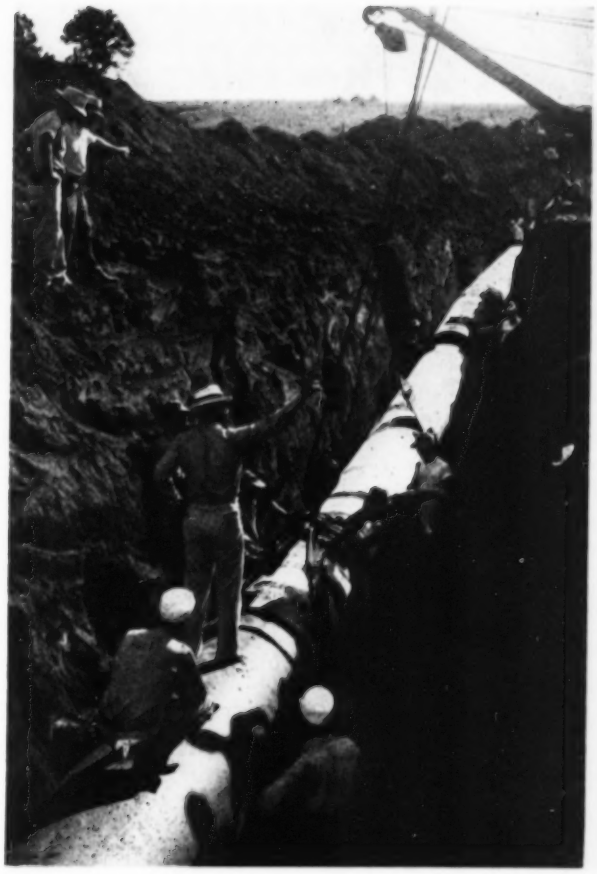
FACTS that prove

Enamel-X

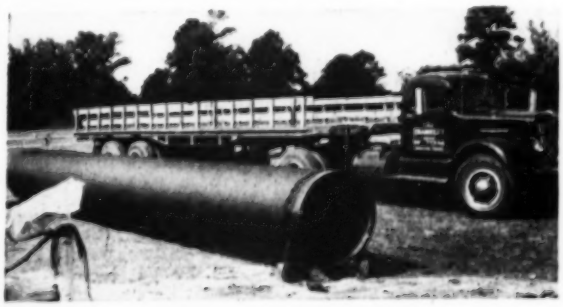
PIPE ENAMELS & PRIMERS

SUPERIOR to other Enamels!

1. Enamel-X enamels have lower specific gravities than other types of enamels; thus, they will give greater coverage of the same thickness for the same weight of material.
2. Enamel-X enamels have greater resiliency than other types of enamels, that is, greater ability to return to their original position after stress.
3. Enamel-X enamels have less wastage during storage and are easier to handle after storage than other types due to less plastic flow.
4. Results of sag tests, cold tests, and peel tests of Enamel-X enamels are superior to test results of any of the other types of enamels.



Tying in a road crossing in Alabama, where Enamel-X was used on one of the largest gas pipe lines ever laid.



The same top-quality coating job was obtained on this large size pipe as was obtained on smaller size pipes. The left top photo shows a close-up of a completed joint (coated) prior to its installation.

With no danger of plastic flow due to heat, Enamel-X can be stacked in the open like cordwood and left indefinitely. Enamel-X is easily handled on both over-the-ditch and yard coating jobs—the cartons are easily loaded and unloaded and the treated cardboard wrap is readily removed prior to the coating operation.

FOR FURTHER INFORMATION SEE OUR NEAREST REPRESENTATIVE

Shipments of ENAMEL-X are made from 18 manufacturing points throughout the country.

The ENAMELEX CORP. OF TEXAS

1220 POLK • PHONE CE-7789 or FA-6858
HOUSTON, TEXAS

PART 2. How telemetering was used in Algonquin system

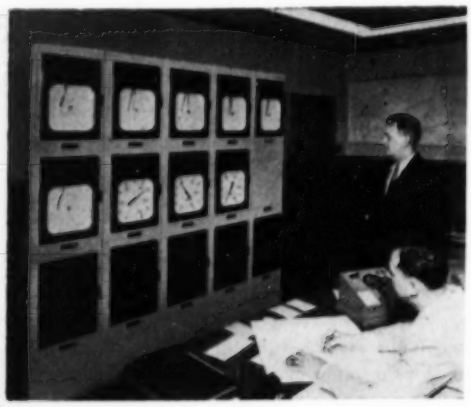


Fig. 4 (right). Telemetering instrument panel at Algonquin's dispatching office. The dispatcher has dialed a code number assigned to an outlying station and is logging the readings shown on the three indicators in the center row.

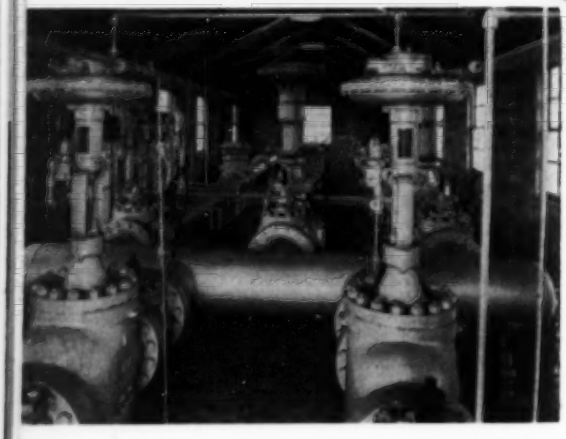


Fig. 5 (left). Interior view of Algonquin's metering and regulating station which supplies Boston Consolidated Gas, one of the system's biggest customers. During severe weather last winter, up to 15 MMcf of gas passed through this station, which is capable of handling much larger volumes.

WHEN Algonquin first began laying plans for operation of its transmission system, the question of how to apply telemetering was one of the first to be encountered. The system was to stretch from Lambertville, N. J., to Boston, while supplying gas at some 33 delivery points to 23 different utilities over 500 miles of pipeline with one-third of the entire system load concentrated in the metropolitan Boston area. Naturally, this necessitated giving that area preferential treatment and closer supervision, while still maintaining adequate knowledge of the conditions at the more distant points in the system. It was decided to locate the dispatching office in Boston.

Since the Boston area represented such a large portion of the load, we decided that *continuous* telemetering of the various measurements of differential and static pressures was necessary. The stations selected lie within a 15-mile radius of the dispatching office, and telemetering is carried over individual leased lines from each transmitting station. Each of the stations where telemeter transmitters have been installed are two- or three-meter-run stations, equipped with differential limit controllers to open the second or third run when the flow through the primary becomes excessive. The dispatcher required information on the temperature and two static pressures at the Wellesley regulator station (see *Figs. 1* and *2*); in addition he wished to know flow values and the upstream pressures at each of three metering and regulating stations in the Boston area.

The recording receivers which continuously cover the area are shown mounted on the panel in *Fig. 3*. In order to avoid having to lease a separate telephone circuit for each function transmitted, Bristol time-multiplexing equipment was used at each station. All the metameter telemeter transmitters at a station are connected to a multiplexing transmitter; the multiplexer sends measurements of each function in sequence along a single circuit to the dispatching office. When the impulses are received by the multiplex receiver on the panel at the dispatch office, they are segregated and directed to the proper recording metameter receiver. The multiplex receivers are shown on the bottom row of the panel in *Fig. 3*. The indicating receivers are used in the selective calling system for the outlying stations, which will be described later.

The electrical impulse-duration, or time-impulse, telemetering system which Algonquin has installed was chosen partly because of the fact that the signal is not affected by changes in current frequency or line impedance, and partly on the ease with which it could be adapted to time-multiplex transmission of multiple readings either by lease line or microwave. In operation it is analagous to the electromagnetic telegraph system, in that the signal transmitted is a function of time rather than of any electrical quantity. The length (or duration) of the electrical impulse is proportional to the measured variable (pressure, flow, or temperature). The telemeter transmitter measures the variable in question, and opens and closes a switch in proportion to the measurement. With the 5-second impulse-cycle system, the length of the signal transmitted will vary from 1 to 4 seconds (20% to 80% of the 5-second cycle). Thus, in a pressure range of 0 to 100 psi, the length of the impulse would be 1 second at 0 psi, 2.5 seconds at 50 psi, and 4 seconds at 100 psi. The signal is repeated once every 5 seconds. The receiver converts the transmitted impulse into a mechanical motion, positioning the recording pen or indicating pointer to a value on the chart or scale equivalent to the measurement taken by the transmitter. The receiver arm does not drop to zero between impulses of course, but maintains itself at the point of the last measurement received.

Under the close supervision allowed by the continuous recording of the various function in the Boston area, the dispatcher has been able to check the actual volume of gas delivered to a customer to within .5% of the value shown by the customer's billing meters. This has been a tremendous help in enabling us to sell our gas up to the maximum allowed without exceeding

our MDQ and going into penalty rates.

In order to keep tab on the outlying stations and the condition of the pipeline as a whole, telemetering facilities were installed at seven points in the system, mainly at the ends of long laterals. The measurements taken at these points naturally are not as critical as those taken in the Boston area from the standpoint of the actual amount of gas consumed by each, but it is essential to the efficient operation of the line to be able to determine the conditions at these points regularly. Therefore, it was decided to use a combination of selective calling and multiplexing to get sufficient information in the easiest, yet most economical way possible. Measurements of the differentials in each run and the upstream or static pressures are being transmitted.

Dialing system used

Each outlying station was put on a selective calling line which could be dialed from Boston. In order to cut down dialing time and effort, a multiplex transmitter is installed at each station, and when the proper code number is dialed, the multiplexer sends all three measurements sequentially along a single circuit to be indicated on the three metameter indicators shown on the panel in *Fig. 3*. The indicators remain connected to their respective transmitters until disconnected by the dispatcher. Normally the entire system is logged once per hour, and critical points or operations more often as needed. *Fig. 4* shows Joseph Martin at the dispatcher's desk, logging a set of readings after dialing the code assigned to one of the outlying stations, while Hugh O'Neil, chief dispatcher, looks on. The static and differential pressure measurements are shown on the three metameter indicating receivers in the center row of instruments (the differential indicator on the secondary run—far right—remains at zero, indicating that the entire load is being handled by the primary).

A check on the accuracy of the values logged on a monthly basis by the dispatcher from the selective calling stations compared to billing records indicates a discrepancy of from .3% to 8.0%. Naturally the higher discrepancies were found in those stations with the more erratic load characteristics. In actual operations, total load of the line based on the dispatcher's information from both continuous recording and selective indicating telemetering varies from that finally shown by the billing meters by only .5 to 1.5%. To us, this is a good indication of the adequacy of our telemetering coverage.

The selective calling system is used operationally during the winter, as was mentioned earlier, to spot the build-up of obstructions in the line before they reach serious proportions. It is common practice for the dispatcher, after logging his hourly readings, to dial into a station which will show existing conditions at the terminal of a section of line under suspicion. In this way, if the upstream pressure at the station begins to drop, while the flow remains constant, and the pressure at the main line also remains constant as shown by another telemetered station, the dispatcher knows that an obstruction is forming some place between the main line tap and the end of the lateral. With this knowledge, he is able to dispatch a crew immediately to investigate and correct the condition. We found that telemetering proved its worth over and over again in minimizing the difficulties of first-winter operation.

Direct telephones leased

While there is no direct telemetering connection with Texas Eastern at Lambertville, N. J. and the dispatch office at Boston, there is a leased direct telephone facility, and the offices are frequently in touch during the day. In addition, there is a telemetering system with a continuously recording metameter receiver at Peekskill, N. Y. where the pipeline crosses the Hudson river. This circuit is only two miles long, but it provides a continuous record of conditions on the western section of the mainline. This point is also in frequent contact with Boston by leased line telephone, and information regarding conditions from this early point in the system proved valuable in packing operations.

When the initial telemetering system was designed, provision was made for remote control of the delivery pressure set-point from the central dispatching office. This control function was to be carried over the same telemetering circuits which served for the transmission of information from the various measurement points in the system. It was arranged so that the set-point on the control valve at each regulating station could be raised or lowered by dialing a code number on the selector dial at Boston. This raising or lowering equipment was supplied with a limiting switch so that errors in dialing would not result in a disastrous change in any given operation. (The indicators on the outlying stations could be left in the circuit while the set-point changes were made, thus furnishing a visual check on the operation of the valves.)

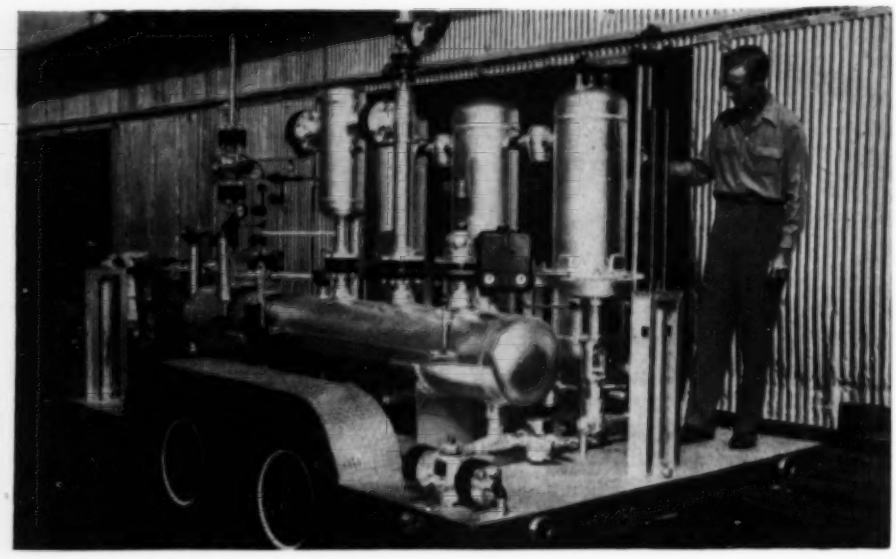
In emergencies

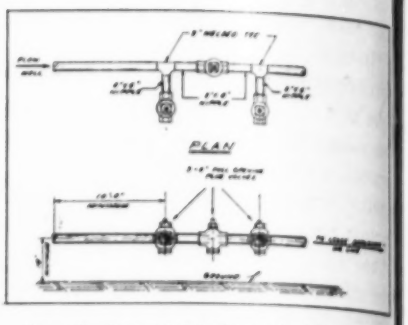
Although the instruments are installed (one of the controllers is shown at far right in *Fig. 2*) and could be activated in short order, the system of remote control has not been placed in operation. It is anticipated that in the future the above equipment will prove mutually advantageous to Algonquin Gas Transmission and its customers alike as it will function as an additional safeguard during emergency conditions. In such service, the remote control would be useful either to discontinue flow or to increase it in the event of a line break or heavy leakage, in an endeavor to maintain service while the line was being repaired. There will also be times when the ability to raise the flow-rate from the dispatching office during winter operations will be desirable.

System-wide telemetering has proved to be the best means of economically and efficiently operating a gas transmission system of this magnitude. Methods of communications which allow for only sporadic information on conditions in the system are not adequate for profitable operation in the type of economy in which we now find ourselves. Naturally, every pipeline has its own particular problems, and the method of applying telemetering will not be identical or even similar in every case. For example, our use of both continuous and selective calling telemetering, coupled with time-multiplexing, even though it is the first such system installed, probably would not suit the requirements of another pipeline with a different pattern of load distribution. However, the elements of the system are basic. With careful study of the problems of the particular system and adequate engineering assistance from the instrument manufacturer and the communication company involved (in our case the Bristol Co., New England Telephone & Telegraph, and American Telephone & Telegraph), an individual system can be developed which will prove completely satisfactory.

GAS exclusive

A portable full-scale tester for high-pressure gas condensate wells





Installation of block and side valves (above) was made on each well to be tested, for connection of the test equipment.

View of the portable tester (left) shows three upright accumulator cells in background, horizontal separator in foreground. Engineer stands beside direct-reading gauge glass. Swivel joints and flexible piping are used for inlet and outlet connections.

By C. D. ATTAWAY

Superintendent of Measurement
Arkansas-Louisiana Gas Co.
Shreveport

THE constantly expanding completion of high pressure gas-condensate wells throughout Arkansas, Louisiana, and Texas has created a testing problem for the many operators and natural gasoline plants who are producing or processing this gas.

Usually such gas wells are tied into the field gathering lines of plants operating in the area and the entire well stream produced into the line. This is a simple and economic solution to the operator as it relieves him of the necessity of installing high pressure separators and tank batteries, and finding an outside market for his fluid production. Fortunate, indeed, is the producer who finds a gas company operating a natural gasoline plant in his area to which he can sell, at a fair and equitable price, not only the extracted products and the liquid production of his well but also the gas produced therefrom.

A common practice between producers and processors is to allocate a percentage of the actual plant production to the well owners based upon the potential recoverable hydrocarbon content of their gas. In order to do this, each well tied into the plant must be tested at regular intervals by a practical and reliable method to determine its theoretical content.

Many companies have made use of a method investigated by the Natural Gasoline Association of America for the sampling of two-phase gas streams from high pressure condensate wells. This "split-stream" or "stinger" test method has a minimum flow rate application in the vicinity of 1.5 MMcf daily. Gas wells prorated to flow rates lower than this or unable to operate at this minimum must be tested by other methods. This is especially true of wells flowing erratically, such as those that are "slugging" or "heading."

In order to secure liquid hydrocarbon content tests on high pressure gas wells having the above characteristics, the Arkansas Louisiana Gas Co. of Shreveport, La., adopted the full-scale separator test as its method. None of the portable full-scale separators on the market exactly suited the conditions. First requirement was a working pressure in excess of that possible with the usual factory-fabricated unit. Furthermore, variable back-pressure control and regulation equipment was desired as well as complete water, oil, and gas separation. In addition, liquid capacity of the conventional models was too low for many applications. Many other features were desired, such as calibrated direct fluid readings instead of liquid metered volumes, extreme mobility in the field, complete unit leveling, means of returning the fluid samples into the high pressure gas line, and flexible test connections.

After considerable study of the requirements and many experimental designs, a final set of specifications was agreed upon and the construction started in the natural gasoline department utilizing the department's personnel for engineering and fabrication.

Construction of the tester

First, a double-axle "level load" trailer utilizing spiral spring leverage action rather than the standard elliptical leaf spring was secured. This four-wheel trailer was equipped with electrically operated brakes. Such a trailer reduces side-sway or load shift and diminishes road shock to provide a cushioned effect and protect the more delicate equipment to be mounted in the unit. The trailer platform, measuring 11½ ft long and 7 ft wide, was fabricated of channel iron. Leveling jacks were located at the two front corners and the rear center as shown in the unit photograph. The trailer was then floored with ¼-in. floor plate, which gave rigidity and strength to bear the weight of the vessels.

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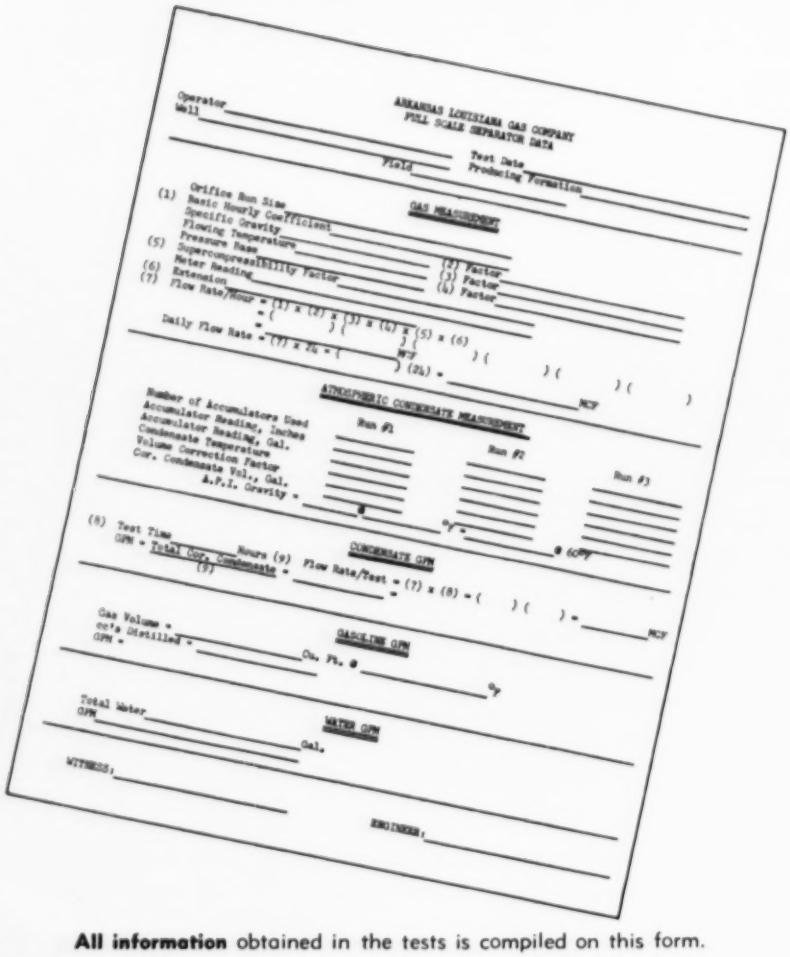
ARKANSAS LOUISIANA GAS COMPANY
FULL SCALE SEPARATOR DATA
Operator
Well
Test Date
Field
Producing Formation
GAS MEASUREMENT
(1) Orifice Run Size
Basic Hourly Coefficient
Specific Gravity
Flowing Temperature
(2) Factor
(3) Factor
(4) Factor
(5) Pressure Base
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(6) Meter Reading
Extension
(7) Flow Rate/Hour = (1) x (2) x (3) x (4) x (5) x (6)
Daily Flow Rate = (7) x 24 =
MCF
ATMOSPHERIC CONDENSATE MEASUREMENT
Number of Accumulators Used
Accumulator Reading, Inches
Accumulator Reading, Gal.
Condensate Temperature
Volume Correction Factor
Cor. Condensate Vol., Gal.
A.P.I. Gravity =
Run #1
Run #2
Run #3
@ 60°F
CONDENSATE GPH
(8) Test Time
GPH = Total Cor. Condensate =
Hours (9) Flow Rate/Test = (7) x (8) =
MCF
GAUGE-TIME GPH
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GPH =
Cu. Ft. @
%
WATER GPH
Total Water
GPH
Gal.
WITNESS:
ENGINEER:

All information obtained in the tests is compiled on this form.

The horizontal separator shown was fabricated from 14-in. line pipe having a ½-in. wall thickness to operate at 2000 psi working pressure and mounted in saddles.

The three identical accumulators were fabricated from the same type pipe as the separator and mounted in a support bracket assembly made from ⅜-in. angle iron.

The unit was piped with a 2-inch gas inlet and a 3-inch gas outlet. By the use of Chiksan swivel joints, a bank of inlet and outlet flexible piping was mounted over the wheel well in a bracket. Adequate safety valve relief was provided as well as bleed and drain valves.

Upon complete assembly, the unit was provided with a trailer hitch and proper tail and clearance lights before being painted. The total weight of the unit is approximately 7000 lb.

Using the tester

In order to use this portable full-scale tester in the field, each well falling within its testing category had to be equipped with an installation of block and side valves as shown in the sketch. This test assembly was located downstream from the well choke and ahead of any heaters or separators. Consideration also was necessary in the location to provide accessibility of the trailer mounted unit.

The mechanics of testing are fairly simple, but require proper preparation of the well before starting the test. The first requirement is that the well must have been on the line at least 24 hours or more previous to the test. It is highly desirable that the well be operating in its normal characteristic manner at the time of the test. Usually this means that the flow rate, pressure, and temperature have not fluctuated widely during the previous 24 hours, and that at the very time of the test it will be operating at the conditions anticipated for the immediate future.

This is usually determined by the tester by observing the meter station on the lease. Here he is liable to secure exact data relative to the well's behavior for the past few days, as most leases are equipped with a 7-day chart, clocks, and recording temperature instruments.

The test unit is usually hooked into the flow line at the test connection or block gate arrangement and allowed to pass the entire well stream for some time until temperatures and pressures equalize and all working parts are operating freely and correctly.

Once all readings and conditions are taken and stabilized, the unit is checked on at a precise time and the accumulation test started under known conditions. The length of the test can vary from 8 to 24 hours depending upon the behavior of the well. Under a uniform, constant flow, accurate results can be obtained in a short period. However, a flow made up of "heads" or "slugs" requires a much longer test in order to secure representative cycles and a series of peaks or upsets. Usually a 24-hour period will provide sufficient information, unless the flow rate is a rapidly declining one in which case, the test may continue until a stabilization is reached or the flow ceases. By means of the three accumulator cells, any number of test runs or checks can be made.

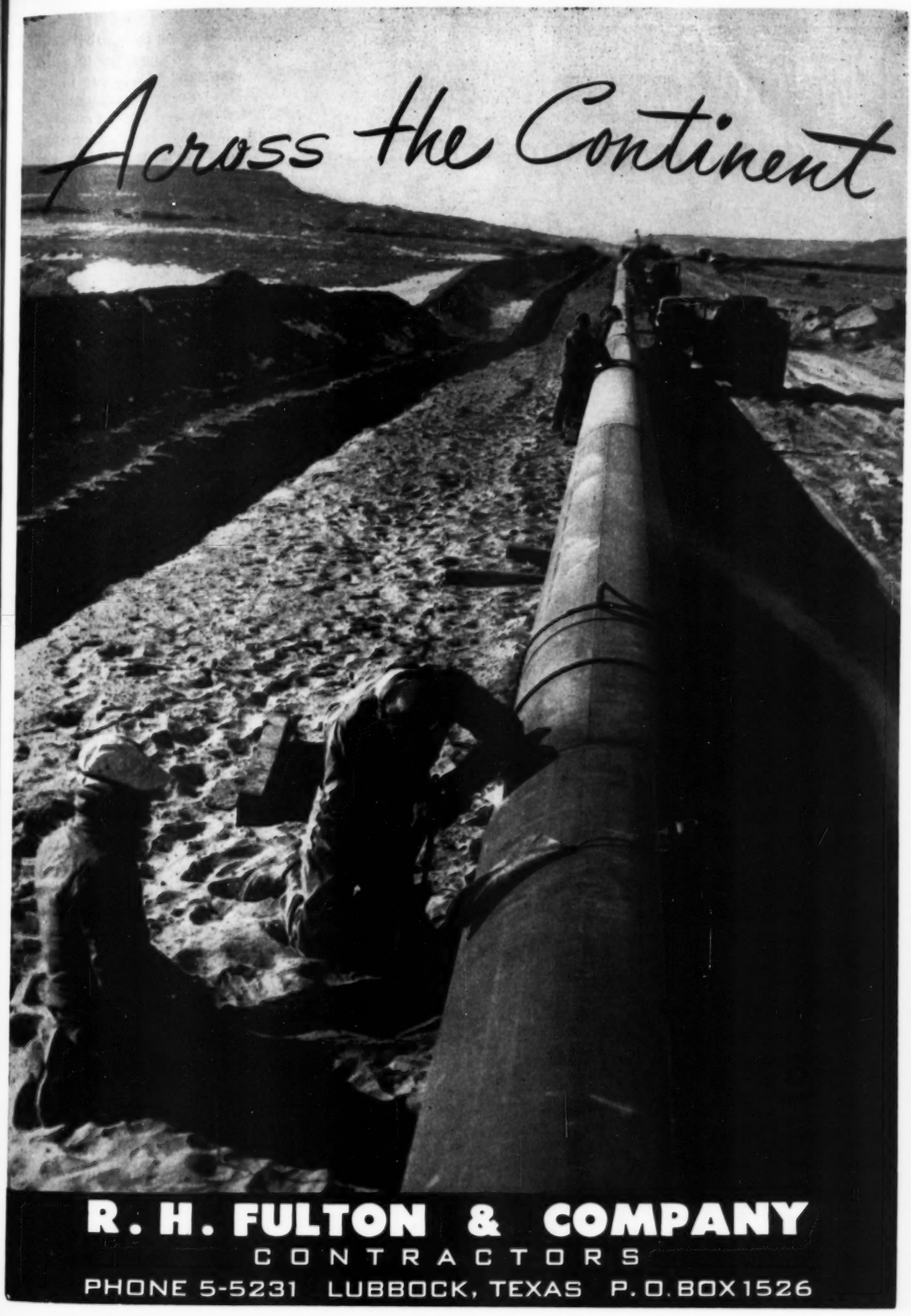
Sometime during the test, usually as soon as the tester is satisfied with the operation of the unit, a sample of the outlet or tail gas is diverted through a charcoal test meter to determine the natural gasoline content.

All information is compiled on a full-scale separator test data form. From these factors can be secured the exact amount of gas that passed during the test as well as the true condensate or fluid recovered. At the same time, the tester can weather or flash the fluid sample to atmospheric conditions and secure a shrinkage factor by which a result expressed in equivalent lease tank recovery can be obtained.

It is also possible to directly read the water accumulation or measure it by draw-off or liquid meter. Often samples of the water are obtained to provide the laboratory with material for determining salt content.

At the conclusion of the test, the accumulated fluid recovered may amount to a considerable volume, sometimes 100 gal. or more. In order to conserve this, a pressure drop can be produced across the unit and the fluid forced out the bottom of the accumulator through the gas outlet and back into the gas gathering line.

The tester delivers his charcoal to the nearest plant laboratory where it is distilled and the results computed. At the same time he may have the water sample analyzed and equipped with this information; he can now furnish a comprehensive report on his well test that provides not only information for the company accounting department, but also useful facts for the production engineers and gasoline supervisors.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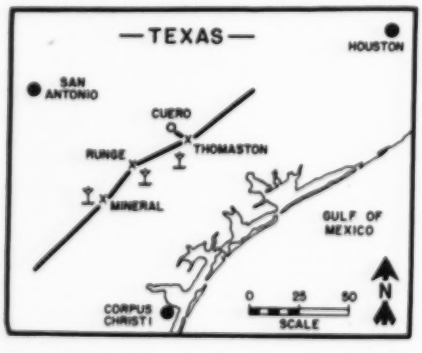
Pipeline Communications and Electronics

By FRANK CHAPMAN

Microwave extends VHF radio's usefulness

The integration of VHF and microwave into one "full coverage" communications system has long been the objective of many gas industry operating people. Whereas VHF provides an ideal form of mobile communication over a radiuus of from 15 to 20 miles, microwave is highly reliable for fixed station communication over long distances. The successful marriage of the two which has resulted in a highly efficient system of communications, including the integrated operations of VHF, voice and telemetering facilities on several microwave links, is described in the following article by E A. Koenig, vice president of Wilcox Trend Gathering System, Inc.

THE Wilcox Trend Gathering System pipeline, for which an integrated system of VHF and microwave communications has been developed, roughly parallels the Gulf coastline some 70 miles inland. It transports natural gas at high pressure from fields on the Wilcox Trend formation along a line extending from the Hagist Ranch field in Duval county to Provident City, Colorado county, where the gas is delivered to the lines of the parent company, Texas Eastern Transmission Corp. The southern end of the mainline consists of 77 miles of 14-in. pipeline which joins the 68 miles of 16-in. pipeline on the northern end of the system. Tied into this mainline are approximately 120 miles of gathering laterals.



The above map shows the route of Wilcox Trend Gathering System's pipeline near the Texas Gulf Coast. VHF radio coverage from end to end is accomplished by means of Motorola microwave relaying which carries the voice messages back to Cuero, headquarters of the operation.

The communications problem on Wilcox Trend was two-fold: first, maintaining VHF radio contact between the dispatching office in Cuero and cars and trucks as far as 100 miles away, and second, voice communications and telemetering between Cuero and the 2200-hp compressor station at Thomaston, seven miles away.

Wilcox Trend's 11 mobiles, licensed by the FCC to operate on a frequency of 48.94 mc, could talk 12 to 15 miles car to car, and perhaps 40 miles to a base station with a high antenna. To talk from Cuero to the far end of the pipeline would require manual relaying of the messages, an expensive undertaking in view of the around-the-clock operations of a natural gas pipeline.

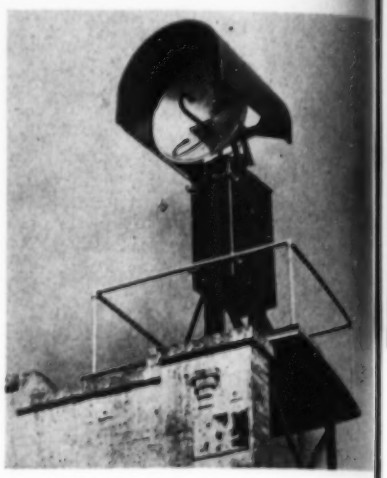
The answer was microwave relay. The Federal Communications Commission granted Wilcox Trend a developmental license to operate on 6585 mc and the company constructed a three-span headquarters with 250-watt VHF fixed microwave system connecting the Cuero stations at Thomaston and Runge in Karnes county, and Mineral located in Bee county.

To assure widest possible coverage by the three VHF stations, their antennas are mounted atop 260-ft guyed towers. The towers also support perforated aluminum reflectors for the microwave beam.

By pushing a selector button, the dispatcher can transmit over the base station in the east, central or west sector. Or he can press his "all-call" switch and activate all three remote stations simultaneously.

When a mobile operator answers, an electronic system samples all three receiving locations and selects the station which is hearing the mobile cleare Thereafter, all messages to and fro that particular mobile are routed v this "best" station automatically.

Principal need for the microwave to tie the VHF base stations togeth over an extended range. However, th span between Thomaston and Cuer also carries a continuous flow of infor mation via telemetering. Readings o pressure and differential taken at th compressors are transmitted automatic ally to Bristol recording instruments i the Cuero office, giving the dispatche an immediate picture of conditions o the line. There is also a duplex voic circuit between dispatcher and the com pressor operator.

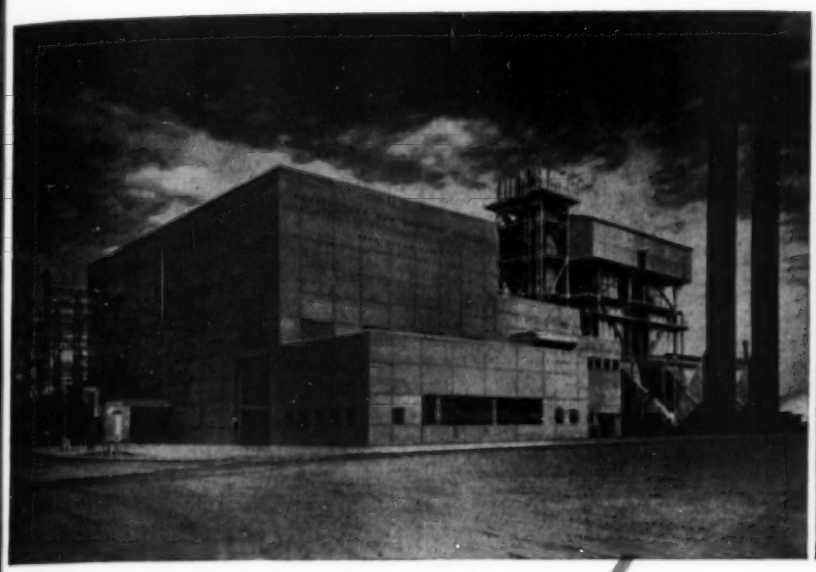


This microwave terminal beams a 6,500-mc signal from Cuero to the tower o Thomaston Compressor station, seve miles away.

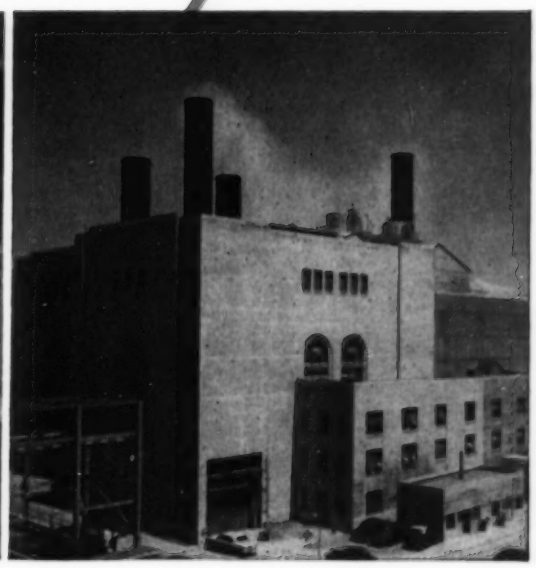
The system is designed so that th Cuero dispatching office is the nerve center of communications. The dispatcher hears all radio transmission even when primary contact is betwee two mobiles close enough to hear eac other. Sometimes S. L. Windham, su perintendent of measuring and dis patching, or C. W. Barnett, superinten dent of pipelines and compressors, ma be out in the field in their radio-equipped autos when another mobile a the far end of the line calls with a question for one of them. When thi happens, the dispatcher in Cuero acts a a relay point, giving the mobiles "end-to-end" communication.

At present Wilcox Trend uses 11 car and trucks equipped with Motorol two-way radio—sedans for the two su perintendents, four ranch wagons fo the measurement engineers, two 1-ton pickup trucks used by maintenanc gangs, two 3-ton trucks for heavy haul ing, and a jeep for general utility.

Oh, I see



KERN, 235,000 HORSEPOWER



STATION P, 360,000 HORSEPOWER

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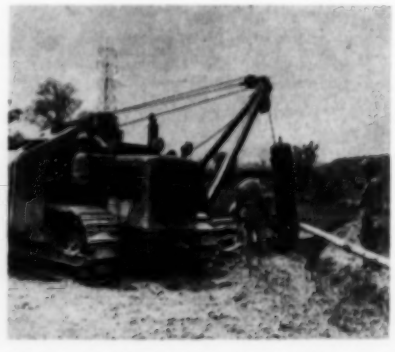
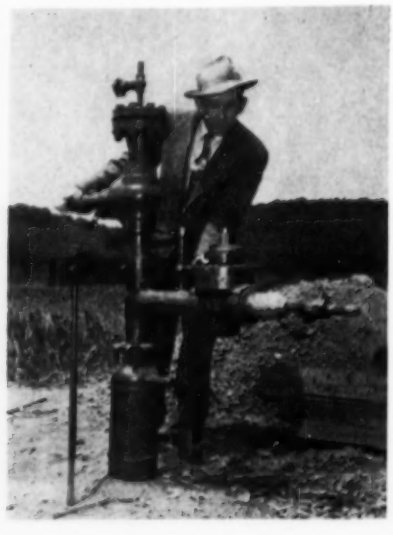




Above — A side-boom "cat" lowers well pipe into trench. **Right** — J. F. King, superintendent of Eastern production field checks valve on new storage well in the Guernsey storage project.

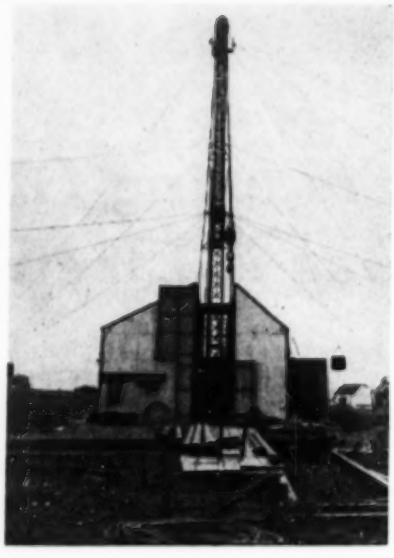
Ohio fuel adds another underground storage field

WORK is under way on Ohio Fuel Gas Co.'s seventh underground storage area and on the expansion of another area.

Known as the Guernsey storage project, the new development is in Guernsey and Coshocton counties, Ohio, underlying about 8000 acres. It will increase Ohio Fuel's storage capacity 6 billion cu ft.

The company is doubling the Holmes storage project, located in Holmes, Ashland, and Wayne counties. The new project, underlying 3500 acres, will add 8.5 billion cu ft.

For the year, $4.5 million will be spent on the above projects and on drilling additional storage wells in other areas of the state.

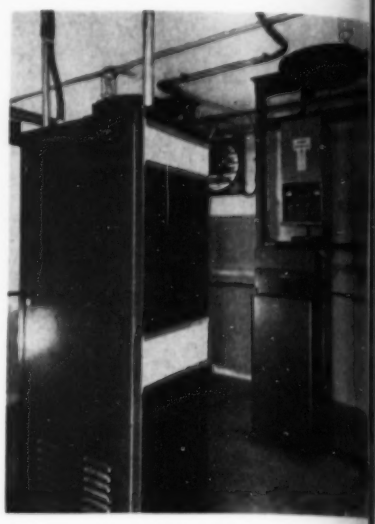


Above — Drilling operations on a well in the new part of the Holmes storage area.

Below — A check is made on a Holmes storage well, deep in the woods. This storage field will be doubled in size.

The mobiles normally are "on" eig
hours a day. The microwave and VH
base stations are kept on 24 hours a d
because the telemetering is used at
times, and also because a mobile alo
the line may need to call into Cuero a
ter regular working hours.

On a radio system of this length, i
expected to have outages from time
time. We've found the microwave-VH
equipment extremely reliable, havi
been shut down less than five hours
seven months of round-the-clock ope
ation.



Above is one of the three remote statio
showing microwave transmitter-recei
at right and VHF equipment at left. Ea
station is housed in a weathertight co
crete building at the foot of the tow

Maintenance of the entire system
handled by the manufacturer, Motor
Inc., on a contract basis. After t
equipment was installed and thorou
ly tested, the maintenance was turn
over to an authorized Motorola servi
technician, Wayne S. Beardsley
Yoakum, Texas, who makes physi
and electrical checks on the syst
twice a month. The mobiles m
Beardsley at the Mineral tower or
Cuero for periodic maintenance a
frequency checks as required by t
Federal Communications Commissi

At present four audio channels
used on the fixed station system. It m
be expanded to a maximum of 24
the future. Each of these 24 chann
may be subdivided to a maximum of
telemetering or supervisory chann
From this it is evident that future
of the system could include the op
ation of up to 200 telemetering and
pervisory functions with some exp
sion of telephone and base station co
trol facilities.

The new pipe line of the Northern Natural Gas Co., consisting of 70.8 miles of 30″ pipe, extends the firm's natural gas service into central Iowa.

New lightweight, reinforced TRANSHIELD ASBESTOS PIPE LINE FELT

Permits high speed wrapping . . . assures effective protection for enamels

TRANSHIELD now offers pipe line men the fine protective qualities of an asbestos shield at a lower price . . . with the added advantage of improved application characteristics. Transhield is a quality felt . . . assuring long trouble-free service. It is designed to meet all ordinary wrapping needs.

Transhield provides a continuous asbestos membrane, protecting and preserving the enamel coating. Highly resistant to soil stress, it is particularly suitable for use where pipe must be laid in heavy clay soils. It cannot rot or decay . . . presents an almost indestructible barrier against soil chemicals.

Contractors like Transhield because its special reinforcement makes it easy to apply, even at high speeds. Embedded continuous glass yarns parallel-spaced on ¼″ centers give Transhield unequaled tear resistance. Transhield's light weight permits furnishing it in 800-ft. rolls. This advantage cuts roll changes in half for field wrapping equipment.

Johns-Manville has developed three wrapping materials for pipe line protection:

J-M 15-lb. Asbestos Pipe Line Felt (perforated or unperforated)—for severe soil conditions.

J-M Transhield Asbestos Pipe Line Felt—for average soil conditions.

J-M Trantex® polyvinyl pressure-sensitive tape—for pipe line corrosion protection where ease of application is important . . . as a coating over field-welded joints of mill-wrapped pipe . . . for rush coating needs such as when making emergency pipe line repairs.

For further information write Oil Industry Department, Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay St., Toronto 1, Ont.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville ASBESTOS PIPE LINE FELT

Mystery of swaying bridge solved by testing model in wind tunnel

The seven-year-old mystery of the dancing Ehrenberg bridge has finally been solved. Carrying the Texas-California pipeline across the Colorado river just east of Blythe, the bridge had, since its erection in 1947, frequently exhibited an odd undulating behavior. With the flexibility of a rubber hose the pipe of the main span would rise and fall as much as five and six feet at about three-second intervals.

Engineers advanced several theories as to what caused the bridge's strange gyrations. One was that the sun's rays on the supporting cables or on the pipe itself were responsible. Another was that gas surges in the main span were causing the up and down motion. Because of the 90-degree approach of the pipeline at either end of the bridge, this latter argument appeared quite plausible.

The idea that the wind was the causitive factor was at first discounted due to the fact that some of the most violent undulations were witnessed on days when there was practically no wind, and high winds apparently had a dampening effect on the motion.

To make a thorough study of the puzzling motion of the bridge a moving picture camera was borrowed from Hollywood. Metal targets were mounted on the pipe to be used as guides against which the oscillations could be measured. To keep the targets in place as the bridge moved, cables were suspended to small anchors and dropped into the river.

After waiting in vain several days for the bridge to repeat its unexplained "dance" the engineers and camera crew returned to Los Angeles. However, the targets were left and the cables continued to dangle in the river.

Sometime later the local inhabitants decided to remove the cables. No sooner had this been done than the oscillating recurred, and back came the engineers. This time it was decided that an exact model of the bridge would be made and tested in a wind tunnel. It was discovered that the cylindrical structure of the bridge span caused eddies at wind speeds of from three to six miles per hour, creating a minute lifting and lowering of the span. These movements, if uninterrupted, mounted in intensity until near-destructive proportions were reached. It was also learned that winds of greater than six-mile velocities tended to reduce the oscillations, while those of under three miles an hour had little effect

The solution to the problem was reached when it was decided to eliminate the aerodynamic characteristics of the pipeline. To break up the smooth contours offered to the wind, 14 horizontal, light metal fins were attached to the pipe span, on alternate sides, from pylon to pylon. Triangular in shape, they present an irregular surface to the wind, and are designed to keep the bridge at rest.

The theory was correct, and regardless of the wind velocities, the bridge remains still.

Fourteen triangular jet-like fins have been attached horizontally to alternate sides of the Texas-California span over the Colorado river. The fins break up the smooth rounded contours of the pipe, which were conducive to forming eddies that set up mountnig vibrations of the span when light winds blew.

Progress Reports

NEW CONSTRUCTION PLANNED

ALABAMA-TENNESSEE NATURAL GAS CO. Florence, Ala. Docket G-2534 for 21.2-mile 12¾-in. pipe in Colbert county, Ala.; 3.7-mile 8⅝-in. near Tuscumbia, Ala.; and 350-hp addition at Muscle Shoals, Ala.

OHIO FUEL GAS CO., Columbus. Docket G-249 for 28 miles of new line and a 140-hp addition at an existing station in Ohio.

TRUNKLINE GAS CO., Houston. Docket G-250 for 6350-hp compressor station at Edna, Texas.

CURRENT CONSTRUCTION

ATLANTIC SEABOARD CORP., Charleston, W. Va. Docket G-2286 for 116.6 miles of 26-in. line in five sections paralleling portions of existing system and addition of total of 4400 hp at two existing and one new compressor station. Western Pipe Line Constructors Inc. contracted for 45 miles of 26-in. from Clendenin to Wadersville, W. Va. Approximately 50 miles complete.

GULF INTERSTATE GAS CO., Houston. Docket G-2058 to construct 850 miles of 30-in. line from Rayne, La., to Boyd county, Ky., 309 miles lateral lines and five 8000-hp compressor stations in four states. Mainline contracts let to H. C. Price and Houston Contracting Co. Lateral line contracts let to Anderson Bros., Associated Pipe Line Contractors and William Bros. Line to be in service Nov. 1, 1954. Pipeline complete; work on compressor stations nearing completion.

HOPE NATURAL GAS CO., Clarksburg, W. Va. Docket G-2413 for a 22½-mile, 12-in. extension to existing line in Boone county, W. Va., to extend across Logan county to connect with producing wells. Pipe Line Construction & Drilling Co. at work. Completion expected Nov. 1.

MISSOURI PUBLIC SERVICE CO., Warrensburg, Mid-States Construction Co. was scheduled to begin work July 15 on 25 miles of 10-in. line from Warrensburg to Clinton.

MONTANA-DAKOTA UTILITIES CO., Minneapolis. Docket G-2397 for 56-mile line in Hettinger and Stark counties, N. D., to supply Regent, Mott, New England, and Lefor, N. D. Ross & Powers at work. Scheduled for October completion.

OHIO FUEL GAS CO., Columbus. Docket G-240 for 24.5-mile, 20-in. line in Richland and Crawford counties, Ohio, to enable it to transport additional gas from underground storage.

OHIO FUEL GAS CO., Columbus. Docket G-22 Contracts let: 7½-mile, 16-in. line, Berlin Heights to Norwalk; 13.3-mile, 16-in. N. Baltimore to Bowling Green. Construction under way: 6.6-mile, 16-in. line to Kenton. Completed: 11-mile, 20-in. and 10½-mile, 16-in. New Riegel to N. Baltimore.

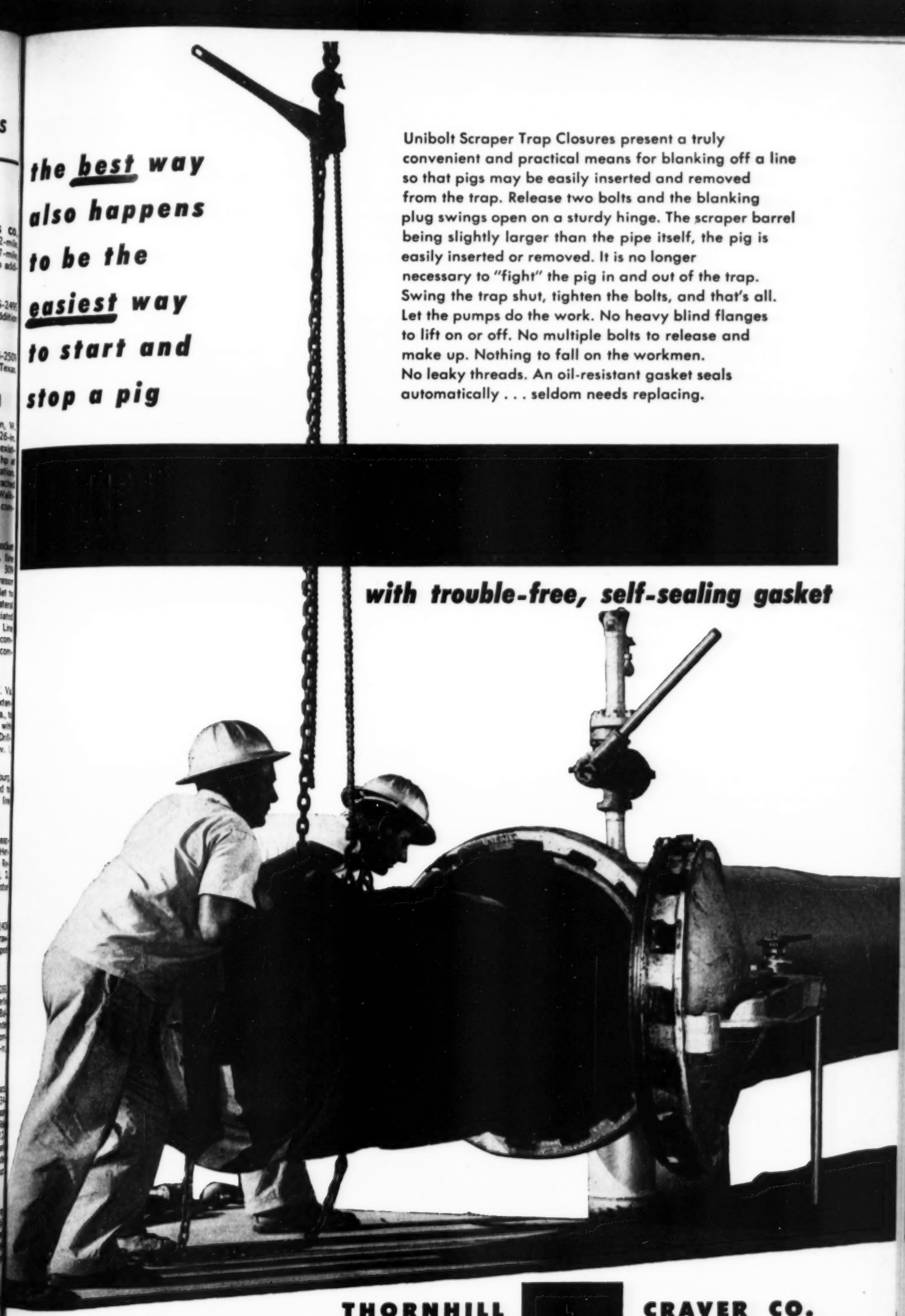
PACIFIC GAS & ELECTRIC CO., San Francisco Docket G-2102 to build about 200 miles of 34-in. mainline loops and add 2500-hp compressor capacity to company's 500-mile Topock-Milpitas line. Remains: Associated construction of 7.2-mile, 30-in. and 34-in. and 1.9-mile, 22-in. and 24-in. between Milpitas and Irvington under contract to M&M Construction Co. for construction in 1954.

SOUTH GEORGIA NATURAL GAS CO., Birmingham, Ala. Docket G-1915 for 368-mile, 12-in. line beginning at connection with Southern Natural line in Lee county, Ala., extending southeast to serve new communities in Georgia and Florida.

the best way also happens to be the easiest way to start and stop a pig

Unibolt Scraper Trap Closures present a truly convenient and practical means for blanking off a line so that pigs may be easily inserted and removed from the trap. Release two bolts and the blanking plug swings open on a sturdy hinge. The scraper barrel being slightly larger than the pipe itself, the pig is easily inserted or removed. It is no longer necessary to "fight" the pig in and out of the trap. Swing the trap shut, tighten the bolts, and that's all. Let the pumps do the work. No heavy blind flanges to lift on or off. No multiple bolts to release and make up. Nothing to fall on the workmen. No leaky threads. An oil-resistant gasket seals automatically . . . seldom needs replacing.

with trouble-free, self-sealing gasket



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Write for brochure and recommendations on your corrosion problem.

The* TAPECOAT *Company

Originators of
Coal Tar Tape Protection

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Evanston, Illinois

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-1907. Construction on 150 miles of 18-in. and 4400-hp station remain for completion in 1955.

TENNESSEE GAS TRANSMISSION CO., Houston. Docket G-1969 for permission to carry gas for Iroquois Gas Corp., Buffalo, to export gas to Niagara Gas Transmission Ltd., Toronto, and to construct 904 miles of line—571 mile, 30-in. from Kinder, La. to Portland, Tenn.; 63 miles of 26-in. loop in Ohio; 45 mile, 20-in. line from Buffalo to U. S.-Canadian border; 58 mile, 20-in. line from Gulf Coast to Kinder station; and 15 miles of laterals in Texas; 17,520 hp additional at existing stations; 6600 hp in one new station. Contracts let to Morrison Constructors Inc., Anderson Brothers Corp., Houston Contracting Co., Oklahoma Pipe Line Constructions, Western Pipe Line Constructors Inc., and Panama-Williams Co. for Kinder, La. to Portland, Tenn. line; H. C. Price Co. for the Ohio loop lines; and Bechtel Corp. for spur line from TGT system to Canadian border. All spreads working on the Kinder-Portland line and 500 miles have been lowered in. Ohio loop about two-thirds complete; Niagara spur about 90% complete.

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky. Docket G-2361 to construct 24-mile, 16-in. line in south Louisiana; add 2000-hp compressor unit at Bastrop, La.; and build purchase meter station in south Louisiana. Pipeline contract let to Houston Contracting Co. Work to start not later than Nov. 1 and to be completed by Dec. 5.

TEXAS EASTERN PENN-JERSEY CORP., Shreveport. Docket G-2341 to construct 265 miles of 24-in. line from Oakford storage field (Pa.) to Texas Eastern Transmission Co.'s Lambertville, N. J., compressor station; a 3300-hp compressor station near storage field. Mainline construction substantially completed and hydrostatically tested; some work to be done on certain river crossings. Work nearing completion on construction and testing of compressor station. Entire project on schedule and ready for operation by Nov. 15.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-2362 for 19-mile, 12-in. line and sale of existing 14-mile, 6-in. line in Vermilion parish, La. Associated Pipe Line Contractors at work. To be completed Oct. 1.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. Docket G-2368 for 57 miles of line parallel to existing system in Louisiana, Mississippi, and Alabama. Contracts awarded to Associated Pipe Line Contractors Inc. Work commenced July 12; to be completed Nov. 1, 1954.

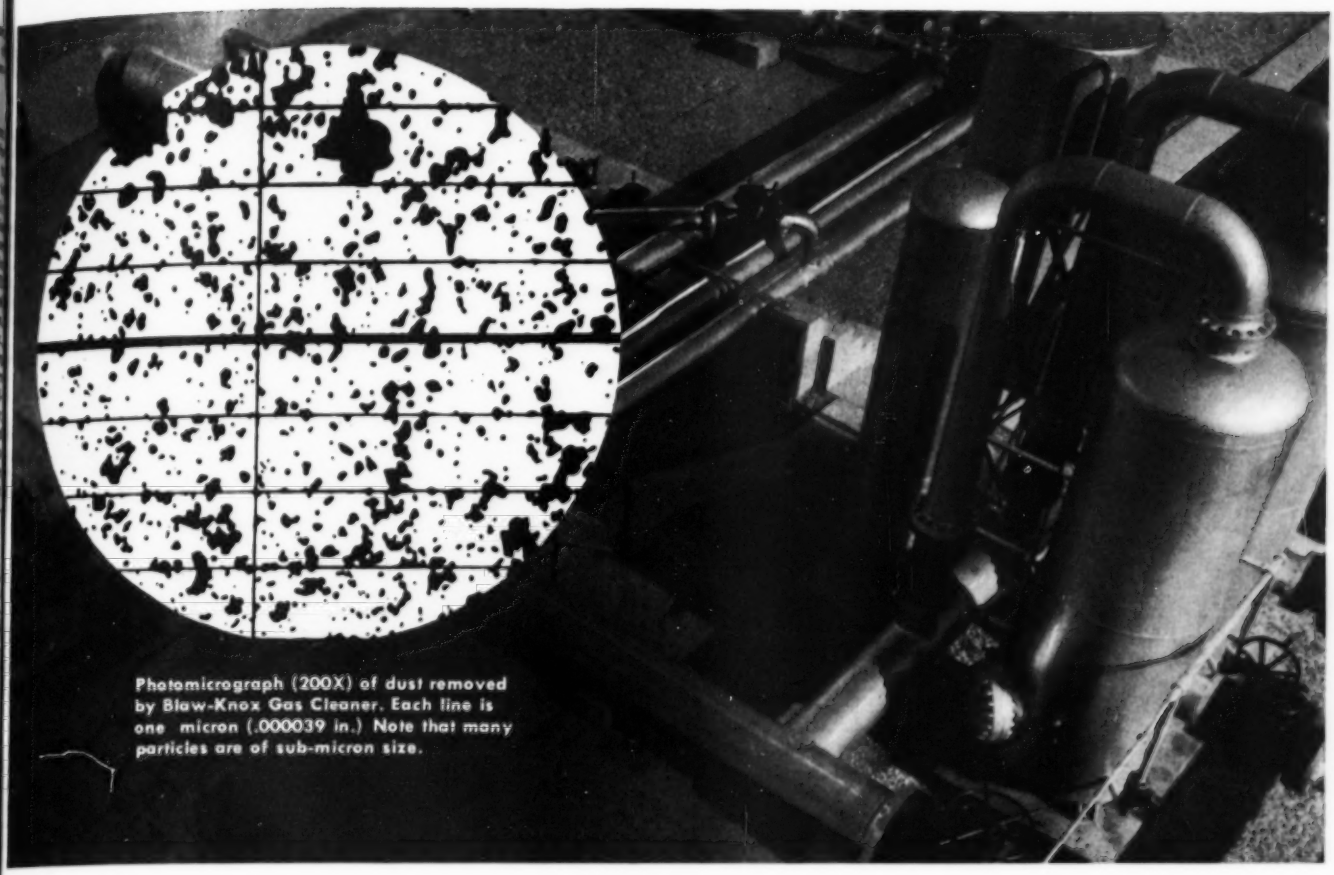
TRUNKLINE GAS CO., Houston. Docket G-2402 for two 24-in. Mississippi river crossings in the Greenville, Miss. area. Also 26-in. interconnecting lines to link new crossing with company system. Missouri Valley Dredging Co. at work on job. Completion expected Oct. 15.

UNITED FUEL GAS CO. and CENTRAL KENTUCKY NATURAL GAS CO., Charleston, W. Va. Docket G-2285 for construction of a 4400-hp compressor station at its storage pool X-59 in Jackson county, W. Va. Also 59 miles of line and 6000-hp compressor station. Contract let to H. C. Price Co. for 57 miles of 30-in. More than 50 miles completed.

APPROVED

MANUFACTURERS LIGHT & HEAT CO., Pittsburgh. Docket G-2479 for 61 miles of line and 1760 hp in compressor capacity on its system in Ohio, Pennsylvania, and West Virginia.

MONTANA-DAKOTA UTILITIES CO., Minneapolis. Docket G-2414 for 34½-mile, 12¾-in. line paralleling existing line from Baker-Glendive field in Montana to Rapid City, S. D.; 14 miles of 12¾-in. replacement line in Park county, Wyo. and Carbon county, Mont.; and 4[illegible] additional hp at existing Little Beaver compressor station in Fallon county, Mont.



Photomicrograph (200X) of dust removed by Blaw-Knox Gas Cleaner. Each line is one micron (.000039 in.) Note that many particles are of sub-micron size.

dust particles 20 microns and below travel easiest, farthest — do the most damage

Field tests prove Blaw-Knox Gas Cleaners remove even the smallest dust particles

The test of any gas cleaner's efficiency should be measured *not* in terms of the amount of dust collected, but in terms of the quantities entrained in the "clean" gas. The removal of a high percentage of large dust particles is a relatively easy task. However, it is the particle sizes of 20 microns and below that travel easiest, farthest and cause the most damage. Blaw-Knox Gas Cleaners remove even the smallest particles of these dusts.

A large number of field performance tests have been run to determine the dust removal capacity of Blaw-Knox Gas Cleaners. Inlet dust loadings ranged up to 547 pounds per million cubic feet of gas. Tests on the cleaner outlet showed absolutely no dust getting past.

The ability of Blaw-Knox Gas Cleaners to maintain such performance is due to an exclusive operating principle through which each tiny particle of dust is placed immediately in violent, intimate contact with oil. In the expansion separation stages, a major portion of dust-laden oil drops out of the gas stream. An oil-wet, multiple baffle, primary separator catches and agglomerates the remaining tiny wet particles. Finally the gas is scrubbed by an efficient, multiple vane mist extractor.

When you buy, be sure to specify Blaw-Knox, for when you place a Blaw-Knox Gas Cleaner on stream, you're sure to remove even the smallest particles of dust.

Blaw-Knox Electroil and Portable Hot Oil Foggers provide a safe, compact, efficient means of producing a stable oil fog in your gas streams.

A STABLE OIL FOG IN YOUR GAS MAINS:

Will wet down existing dust deposits.

Will prevent drying out and eventual dislodging of existing wet deposits.

Will moisten leather diaphragms.

Will curb internal corrosion of steel mains.

Will prevent loss of odorant by reaction with pipe scale.

Will help to prevent drying out of jute-joint packing.

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Blaw-Knox Equipment Division
Gas Equipment Department
Pittsburgh 38, Pennsylvania

Pipeline News

Rates, taxation, insurance occupy INGAA annual meet

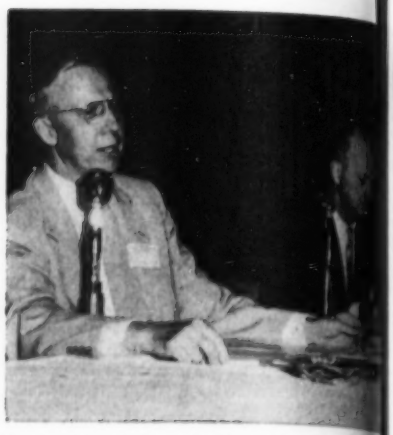
Matters of rates, taxation, insurance and most particularly the problems that have been thrust upon the industry because of the recent Supreme Court decision in the Phillips Petroleum case occupied the attention of those attending the annual meeting of the Independent Natural Gas Association of America in New Orleans on September 13-14.

(A roundup of talks given on the Phillips case, FPC Order 174-A and industry analysis of the general situation is the subject of another article in this issue.)

The association wound up the two day meeting by electing the following officers for the coming year:

President, John F. Merriam, president of Northern Natural Gas Co., Omaha; first vice president, J. J. Hedrick, president, Natural Gas Pipe Line Co. of America, Chicago; second vice president, Glenn W. Clark, president, Cities Service Gas Co., Oklahoma City.

The matter of public information was singled out frequently during the meeting as one of the strongest weapons the industry has against adverse regulation such as that brought about by the Phillips case decision.



Discussing "How the FPC Interprets the Supreme Court Decision in the Phillips Case" are Willard W. Gatchell, FPC (left), and William S. Tarver of the INGAA legal committee.

In one of the meeting's keynote addresses, W. E. Wilson, director of public relations of the United Gas Corp. and chairman of the association's public information advisory committee, sounded a warning that "current developments in the natural gas business emphasize the necessity for a solid and united effort on the part of all segments of the industry—producers, royalty owners, pipeliners and distributors—to properly inform consumers of their stake in a competitive natural gas industry free of artificial controls."

C. P. Rather, outgoing president of the association, emphasized the current importance of the public information program in his annual report to the convention. He pointed out that it is the policy of the advisory committee, headed by Mr. Wilson, to outline a program that will properly inform the public as to the three segments of the industry, the relationship of each segment to the other and their separate functions, and do this in such a manner that the public can properly evaluate the industry and its needs in terms of public interest.

The "key" objectives of the INGAA public information activity were cited by Mr. Wilson as being: "To inform the public about industry-wide operations and at the same time build understanding between all segments of the industry to establish a common ground from which to work in solving major industry problems; to point up the indisputable fact that it is more in the public interest that adequate supplies of natural gas be made available to the public at attractive prices than that adequate supplies be available at bargain prices."

Other "'key" objectives of the activity are "to emphasize that if consumers are to enjoy a dependable supply of natural gas now and in the future, all segments of the industry are entitled to an incentive of a fair profit for their roles in bringing natural gas from the well to the consumers' burner tips.

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PREFABRICATED HOUSES
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Modern STURDYBILT Prefabricated Houses were selected by Gulf Interstate for employee housing. The houses were painted in different color combinations to give the community extra distinction.

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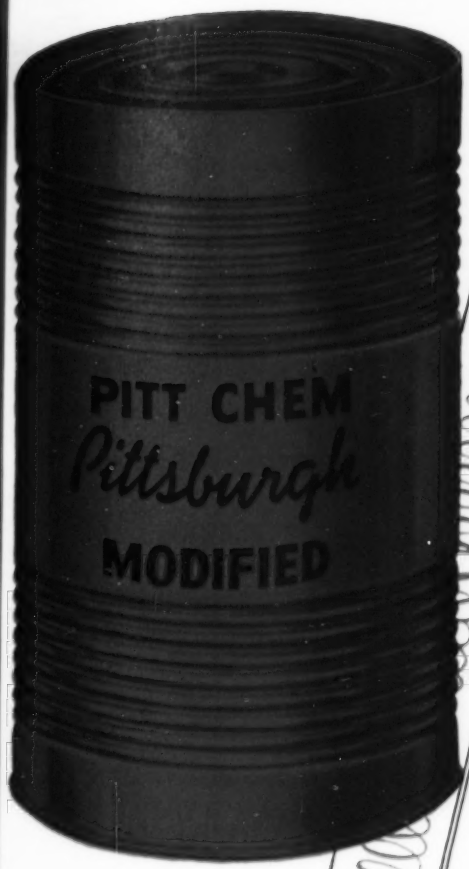
STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS135 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES



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Specific gravity, A.S.T.M. D-71	1.40-1.50
Softening point, A.S.T.M. D-36	190-200°F.
Penetration, A.S.T.M. D-5 100 g., 5 sec., 77°F.	2-6
Ash, A.S.T.M. D-271	20-25%
Sag test, 7 hrs.	no sag at 140°F.
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That's why it pays to carefully examine the specifications of any pipeline enamel you buy and be sure that every drum of the enamel meets those specifications.

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New officers of the INGAA elected at the annual meeting are (l to r): J. J. Hedrick, 1st vice president; J. F. Merriam, president; and Glenn W. Clark, 2nd vice president.

and to work for coordination of INGAA public information efforts with those of the other national gas and oil associations and their regional, state and individual company affiliates."

In his annual report President Rather reported optimistically upon a special committee of the association, which, together with certain non-association members, had met with the Federal Power Commission at the invitation of Chairman Kuykendall to discuss a means whereby the commission might facilitate its procedures under the Natural Gas Act. The committee submitted to the commission a group of suggestions for changes in its rules and procedures which it thought would produce constructive results, both for the commisison and for the industry.

On Aug. 6 of this year, according to Mr. Rather, Commissioner Kuykendall, in a letter to the association, responded to these recommendations. In some instances they were accepted, in others the commissioner agreed the present rules needed clarifying or that, since as a matter of practice the commission was following the procedure suggested, such procedure should be made certain. In some instances the recommendations were not accepted. However, Mr. Rather pointed out that he had been advised by Commissioner Kuykendall that his letter responding to the recommendations was not intended to close the door to further discussion.

The desirability of the United States and Canada working out some program "whereby we could have a free exchange of gas and petroleum and products" was expressed by N. E. Tanner, president of Trans-Canada Pipe Lines Ltd., in a talk before one of the general meetings.

Mr. Tanner, whose company has been authorized to build a 2000-mile pipeline to transport gas from the fields in western Canada to eastern Canadian markets, also urged that the natural gas, as well as other industries, be encouraged to develop through the competitive enterprise system and not be stifled by unnecessary government regulation.

Commenting upon the action of the FPC in rejecting the application of Westcoast Transmission Co. to transport Canadian gas to serve markets in the Pacific Northwest area of the U. S., "mainly on the basis that the United States' consumers should not be dependent solely on a foreign supply of gas," Mr. Tanner said he was not criticizing the FPC for this, since the members of that

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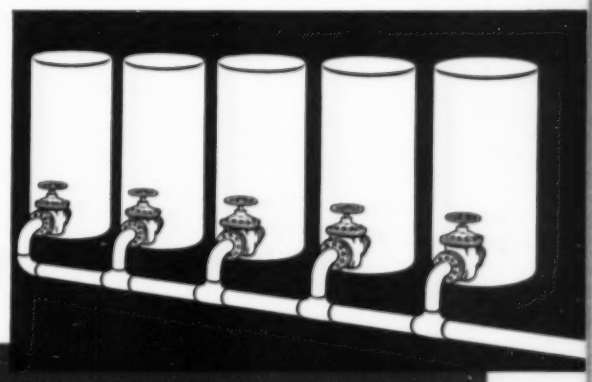
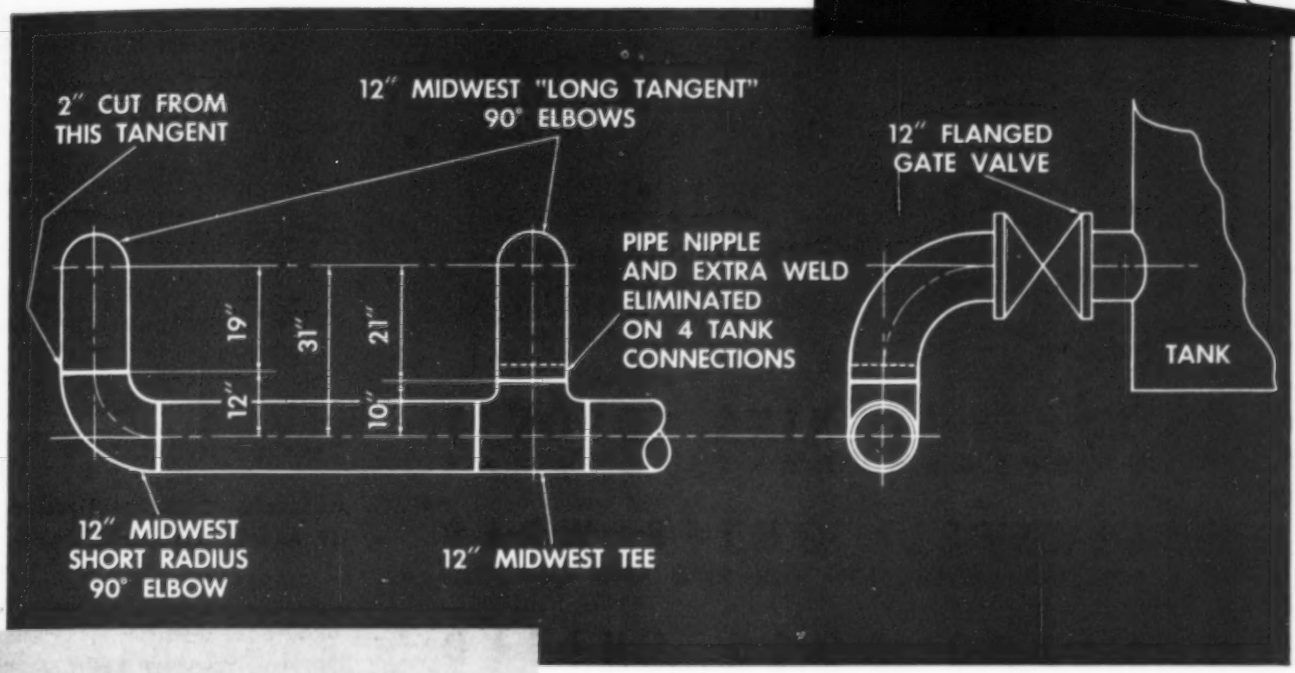
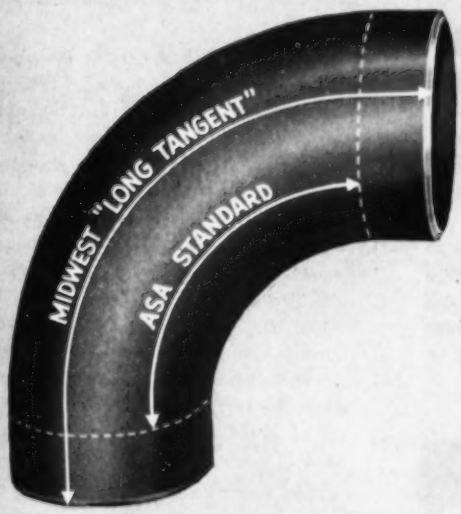




MIDWEST "LONG TANGENT" ELBOWS COST NO MORE THAN OTHER ELBOWS



The Problem:

To connect the five tanks shown in the sketch at top to a common 12" header.

The Difficulty:

The center-to-outlet dimension of the 4—12" tees is only 10", while the shortest elbow available measures 12" center-to-end. Thus, if standard long radius elbows are used next to the five tank valves, four short nipples and four extra 12" welds would be required.

The Solution:

By using Midwest "Long Tangent" elbows as shown in the blueprint, the expense of the four extra nipples and welds was eliminated at the cost of just one cut! The actual net savings made by "Long Tangent" elbows on this job was $156.20.

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MIDWEST WELDING FITTINGS IMPROVE PIPING DESIGN AND REDUCE COSTS

agency have a job to do and "ruled as they saw fit."

"The results, however," he said, "could be vary far reaching and in any event have emphasized again and brought into focus a question which in my humble opinion is of major importance to these two great nations."

He reviewed the development of natural gas and oil reserves in Canada, and said that the official government estimate places the natural gas reserves in Alberta as of 1954 at 13.4 trillion cu ft. The government, he added, has estimated that with the present trend an annual increase in the reserves of 1.3 trillion cu ft is anticipated.

Montana-Dakota facilities authorized in three states

Montana-Dakota Utilities Co., Minneapolis, has been authorized to construct and operate facilities in Montana, North Dakota and South Dakota (Dockets G-2397 and 2414).

Authorized is a total of about 56 miles of pipeline in Hettinger and Stark counties, N. D., to supply natural gas to Regent, Mott, New England and Lefor, N. D. Montana-Dakota also will build distribution systems in the four towns. Total estimated cost of the project is $728,854, including $165,047 for the distribution systems.

The other authorized project involves the construction of about 49 miles of pipeline and an additional 440 hp in compressor capacity on the company's system in Montana and South Dakota. About 15 miles of the new pipeline will replace existing line. Total estimated cost of the project is $1,366,944.

Trunkline ordered to serve six communities

Presiding Examiner Francis L. Hall has filed a decision directing Trunkline Gas Co., Houston, to supply natural gas to Flora, Ill.; Newbern, Troy, Trimble, and Obion, Tenn.; and Byhalia, Miss. All of the towns had filed applications with the FPC to order Trunkline to establish connections with facilities that they would construct, and to supply them with gas (Dockets G-2180, et al).

Total estimated cost of the natural gas systems which each of the towns proposes to construct is $1,111,000. Trunkline will bear the cost of constructing the metering and measuring equipment and of making connections.

Trunkline will supply the towns with the following maximum peak-day requirements (in cubic feet): Flora, 1,860,000; Newbern, 800,000; Troy, 387,000; Trimble, 355,000; Byhalia, 367,800; and Obion, 611,000.

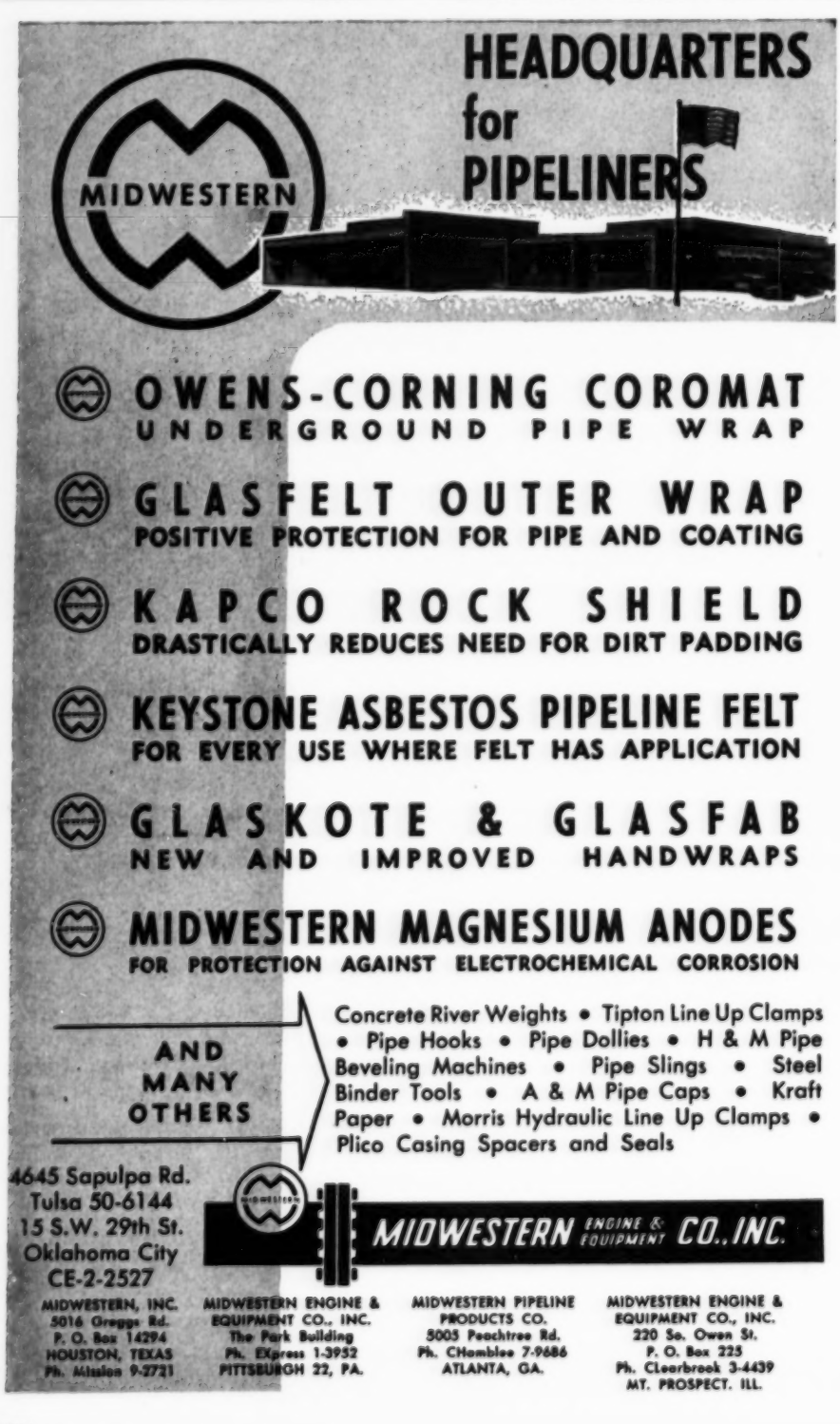
FPC clarifies rate order of Michigan-Wisconsin

Clarification of certain statements contained in its Opinion No. 275, issued July 30, ordering reductions in the amounts of increases in wholesale natural gas rates proposed by Michigan-Wisconsin Pipe Line Co., Detroit, has been issued by the FPC.

The clarification relates to the language used in the FPC's discussion of costs attributable to the minimum wellhead price established by the Oklahoma Corporation Commission.

In Opinion 275, the commission said that the gas produced in Oklahoma delivered by Phillips Petroleum Co. to Michigan-Wisconsin as part of its gas supply amounted to 6,161,369,000 cu ft during the test year ending April 30, 1952. A part of this gas, the opinion said, was produced by Phillips and a part was purchased from others but the record does not show the relative volume s.The commission then stated: "To the extent that a portion of this gas was produced by Phillips, there is no justification for attributing to such volume any increase above the established contract price by reason of the Oklahoma minimum wellhead price order in question."

The commission declared, that on the basis of the record in this docket, the Oklahoma minimum wellhead price on the entire 6,161,368,000 cu ft of natural gas produced in Oklahoma during the test period and delivered by Phillips to Michigan-Wi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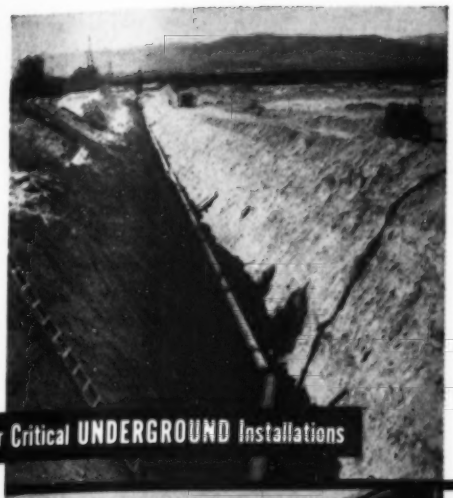

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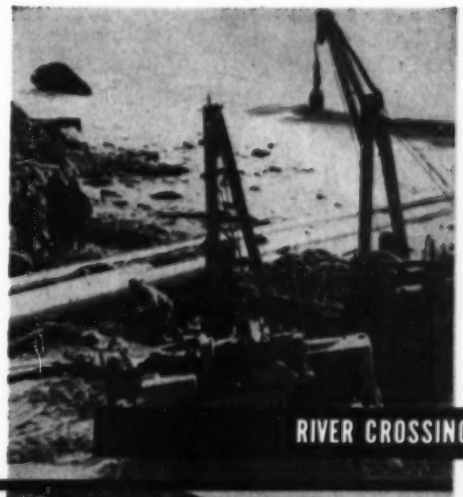

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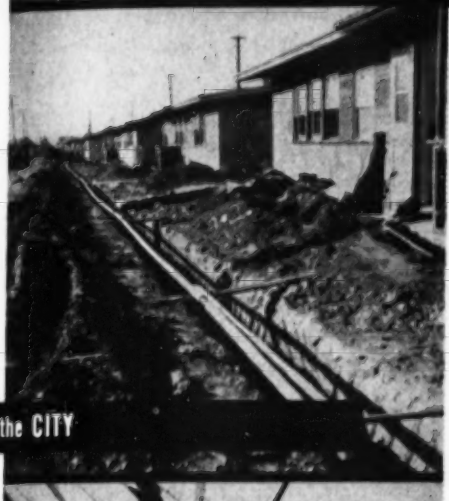

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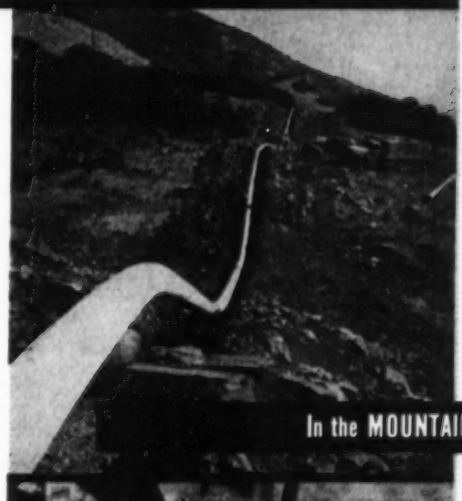

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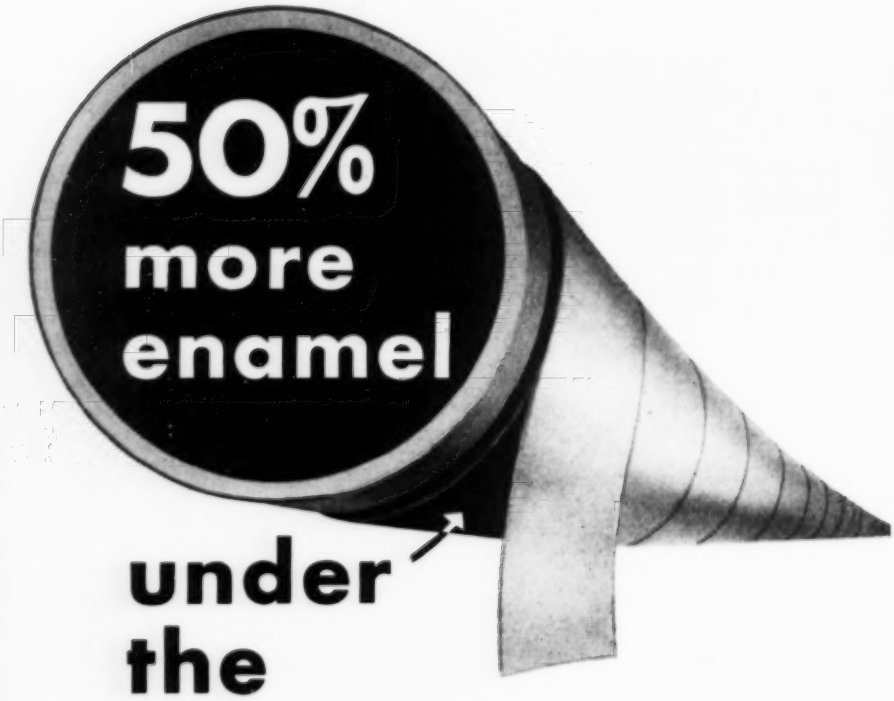

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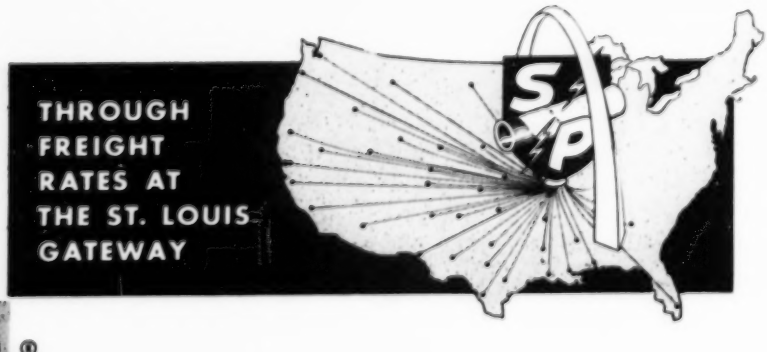

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Derby Oil to be merged with Colorado Oil & Gas

Plans for the merger of the Derby Oil Co., Wichita, Kan., into the Colorado Oil & Gas Corp., Denver, have been agreed upon substantially. The merger agreement is expected to be submitted to the stockholders of the two companies within the next 30 to 45 days.

Colorado Oil & Gas, which is 64% owned by Colorado Interstate Gas Co., Colorado Springs, has substantial gas reserves in the Greenwood field in Kansas, the Keyes field in Oklahoma, and in the San Juan basin of Mexico.

Longest undersea pipeline planned for Gulf of Mexico

Plans for what is called the world's longest undersea pipeline will involve a 48-mile line to be laid in the Gulf of Mexico off the coast of Louisana. It will be a 12-in., electric-welded steel pipe with a double coal-tar enamel wrap and a 12-in. reinforced concrete coating.

The line, designed to carry both crude oil and gas from offshore fields, is a joint undertaking of the Magnolia Petroleum Co., an affiliate of Socony-Vacuum Oil Co., the Continental Oil Co., and the Newmont Oil Co.

Brown and Root, of Houston, will build the line, which will be operated by Magnolia.

Rehearing granted North Dakota Natural

The North Dakota Public Service Commission was scheduled to rehear the application of the North Dakota Natural Gas Transmission Co., St. Paul, to build a 474-mile line from Tioga to Grand Forks and Fargo, N. D.

North Dakota Natural claimed that the dismissal of its application contained certain "specifications of error." The commission held that there were no specifications of eror in its order, but that the "new evidence" that North Dakota alleged it had gathered was sufficient grounds to reopen the hearing.

Tennessee Gas establishes operating research center

Tennessee Gas Transmission Co. recently established a new operating research center in its headquarters city, Houston, marking a forward step in its continuing efforts to achieve new economies and efficiences in the transportation of natural gas.

Director O. H. Moore of the company's

Every Mile of Pipe

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DURING CONSTRUCTION

Large-scale use of compressed air for testing and pigging marked another first for Gulf Interstate in construction of their gas pipe-line system. Compressed air proved to be an economy as well as a time-saver in the following operations:

(1) Low-pressure air propelled a series of Pigs through each section to scrape out all rust, scale and construction dirt.

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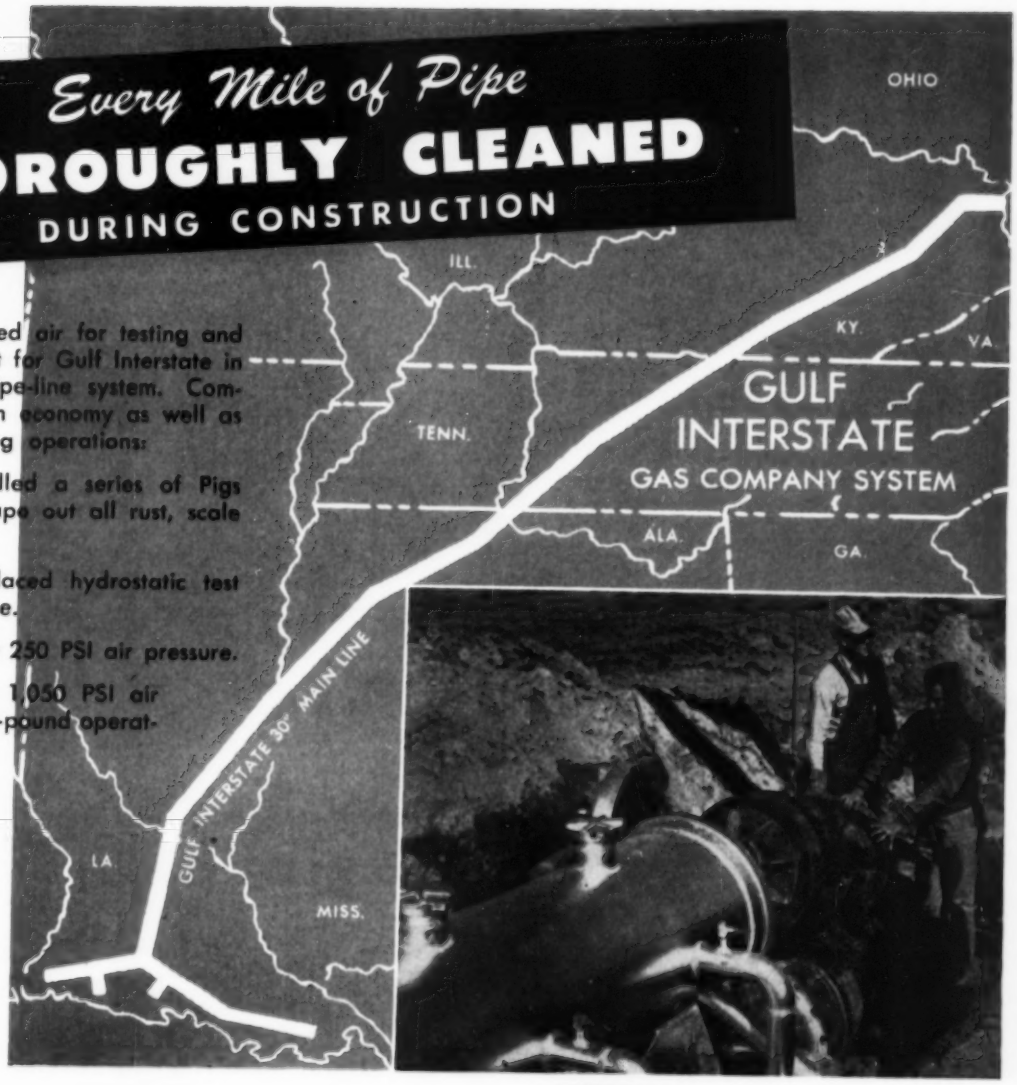
(3) Leak tests were made at 250 PSI air pressure.

(4) Pipe-line was tested at 1,050 PSI air pressure, or 112% of the 935-pound operating pressure.



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At right are the types of WmSON PIGS, ranging from 4" to 30" sizes, which were selected by the WmSON Field Representative who assisted in their proper use.

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operating research department heads the center, which is located in a newly completed and modern one-story brick and masonry laboratory building. The structure, located on a 19-acre tract of land and containing some 17,000 sq ft of floor space, also houses the firm's anti-corrosion and communications activities, supervised by A. L. Stegner.

Operating research at the company has resulted in substantial economies in the volume of fuel consumed per Mcf of gas compressed in the 26 compressor engines on its 2200-mile south Texas-to-New England pipeline system. Further work is being done along this line.

Other matters receiving attention are compressor-cylinder performance, supercompressibility and gas deviation, gas pulsation and engine vibration, as well as pressure loss in yard piping and mainline valves, pipeline flow efficiency, engine ignition, and instrumentation for test work and routine operation.

Tennessee Gas Transmission Co.'s new operating research center, which houses both operating research and anti-corrosion and communications activities.

Both operating research and anti-corrosion and communications activities are supervised by W. C. McGee Jr., vice president and general superintendent.

New company to produce unplasticized PVC fittings

A new patented process of injection molding of unplasticized polyvinyl chloride will be used exclusively by a company just organized, Tube Turns Plastics Inc., in the manufacture of industrial plastic pipe fittings and custom molded products.

The new process and equipment owned by the new company will permit the use of difficult-to-mold PVC and similar plastic materials in the fabrication of products that cannot otherwise be manufactured economically on a commercial scale, company officials said.

Tube Turns Plastics, which will be located in Louisville, Ky., was established jointly by Tube Turns division of National Cylinder Gas Co. and Jackson & Church Co.

Tulsa construction company divided into two firms

Midwestern Constructors Inc., engineering and construction firm of Tulsa, has been divided into two firms.

A new company, Tuloma Builders Inc., will handle gasoline plant, industrial plant, compressor station, and oil pump station engineering and construction. Midwestern Constructors will specialize in pipeline construction.

Officers of the new company are Clyde Wyant, president; T. F. Hansen, chairman

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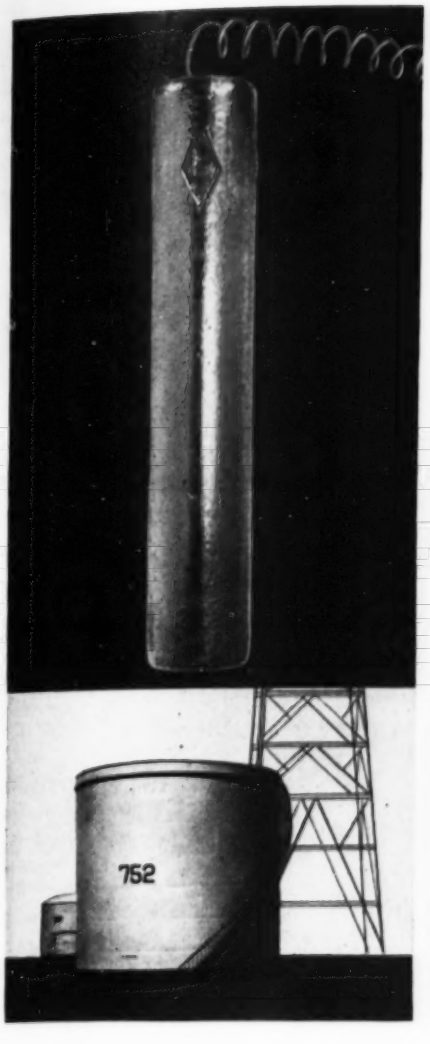

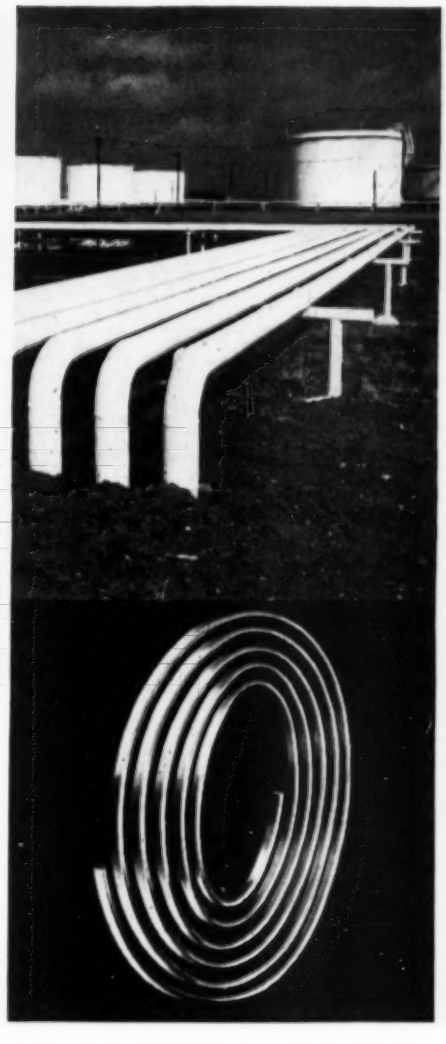
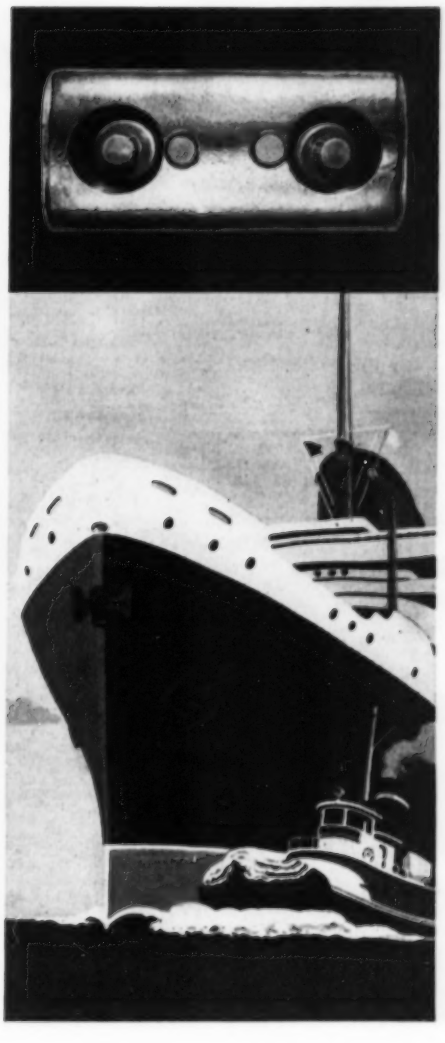

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of the board; J. A. Bard, vice president; and Miss Grace George, secretary treasurer. They were formerly officers of Midwestern.

Midwestern will be headed by F. L. Stanley, president; C. C. Bledsoe, vice president and treasurer; Ray C. Robertson, secretary; and Mrs. R. P. Ryder, assistant secretary and treasurer.

Two million-dollar jobs completed by Ohio Fuel

Ohio Fuel Gas Co., Columbus, has completed two pipeline projects designed to improve service to Toledo and other smaller northwestern Ohio cities.

At a cost of $1,072,000, the company built a 24-mile, 20-in. line from Mansfield to Crestline; the second line, between New Riegel and North Baltimore, was put in at a cost of almost $1 million.

Pipeline Notes

Permanent authorization has been given Lone Star Gas Co., Dallas, for the construction of pipeline facilities for the storage of natural gas in the New York City field in Clay county, Texas. The project includes a 2640-hp compressor station and about 9 miles of 12-in. pipeline. Estimated cost of the development program is $1,144,617. Estimated maximum input into the storage reservoir is about 20 MMcf per day and the company expects to be able to withdraw up to 80 MMcf daily.

The FPC has issued a June 30, 1954, revision of its map of "Major Natural Gas Pipelines" in the United States. The map supersedes the Dec. 31, 1953, edition. The map is approximately 13 by 19 in. in size and is printed in four colors on a scale of 165 miles per in. The map shows major existing pipelines, those which are under construction or have been authorized but not yet started, and proposed lines which are pending before the commission.

Operating revenues of natural gas pipeline companies totaled $111,554,069 in June 1954 and $1,521,045,172 for the 12-month period then ended, representing increases of 10.4% and 17.8% over revenues of $101,046,820 and $1,291,364,817 received in the like periods a year earlier, the FPC reports.

Utility operating income for the month of June amounted to $16,854,128 and for the 12-month period to $240,349,325, higher by 11.9% and 17.0% than the amounts of $15,060,825 and $205,367,977 earned in those periods a year ago.

A certificate has been issued to the Manufacturers Light & Heat Co., Pittsburgh, authorizing it to construct and operate approximately 61 miles of gas transmission line and 1760 hp in compressor capacity on its system in Ohio, Pennsylvania, and West Vir-

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45-30 THIRTY-SEVENTH STREET
LONG ISLAND CITY 1, NEW YORK

Heavy concrete coated pipe is being pulled across the Schuylkill river into a trench previously prepared for it in the bed of the river during construction of the Texas-Eastern Penn-Jersey Corp's 24-in. line. Penn-Jersey, a wholly owned subsidiary of Texas Eastern Transmission Corp., is building the 265-mile line in Pennsylvania and New Jersey. The parent company will lease and operate the new line.

ginia (Docket G-2479). Most of the proposed new pipelines and compressor capacity would replace existing facilities. The proposed new facilities would be located in Columbiana, Belmont, and Monroe counties, Ohio; Ohio county, W. Va.; and Beaver, Washington, Allegheny, and Westmoreland counties, Pa. The total estimated cost of the project is $4,099,250.

Trunkline Gas Co., Houston, has filed an application (Docket G-2509) asking the Federal Power Commission to authorize the construction of a 6350-hp compressor station on the company's natural gas transmission system in Texas. The proposed new station would be located at Edna, Texas, on Trunkline's Texas supply line. Total estimated cost of construction is $1,563,800. The station would contain just one compressor unit.

Shelby Jones Co., Havertown, Pa., has been appointed exclusive sales representative for Hamer valves in the eastern Pennsylvania, Delaware, and southern New Jersey territories by Hamer Valves Inc., Long Beach, Calif.

Kaiser Steel Corp. has established a sales office in Phoenix, Ariz. John C. Mackey will be the representative in Phoenix.

Ohio Fuel Gas Co., Columbus, has applied for authorization (Docket G-2495) to construct about 28 miles of new pipeline and a 140-hp compressor unit at an existing station on its natural gas transmission system in Ohio. The new facilities, estimated to cost $832,700, would parallel or replace

PIPELINE CONTRACTORS SPECIFY...

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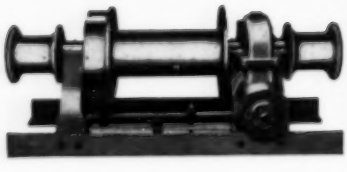

This contractor's truck mounts a Model 23 Tulsa Winch. The earth auger is powered forward with a Model 19 Tulsa Winch.

Contractors everywhere choose Tulsa Winch to lighten their equipment-moving jobs. Tulsa Winches are available in 28 models, in capacities from 6,500 to 80,000 lbs., for every model and make of truck or crawler tractor.

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For Exceptional Service to Safety

On May 5, 1954, the National Safety Council announced from Chicago that BUTANE-PROPANE News had been voted the Council's Public Interest Award for 1953 . . . *"for exceptional service to safety"* in publishing the BPN Safety Program — Carl Abell's widely acclaimed safety training articles, which have appeared each month since February 1953.

Official presentation of the award was made June 21, 1954. In the photograph you see Editor Carl Abell accepting the award for BUTANE-PROPANE News from President Lloyd Van Aken (left) of the Greater Los Angeles Chapter, and Earl Campbell (right) western representative of the National Safety Council.

Other awards made this year to BUTANE-PROPANE News and to Editor Carl Abell include Certificates of Meritorious Achievement from the Pan American Casualty and Insurance Companies, and the Man of the Year award to Mr. Abell by Western Liquid Gas Association.

LPG operators have expressed their own approval of this outstanding editorial service many times, in their own way . . . by voting B-P News their first choice of LPG publications, in every independent reader survey made by advertisers.

And advertisers have accepted these votes of confidence as the true measure of B-P News' standing with the industry, by using more advertising pages in B-P News every year for 13 straight years, than they have used in any other LPG publication. *"Advertising STAYS when advertising PAYS."* BUTANE-PROPANE News, 198 S. Alvarado Street, Los Angeles 57, California.

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sections of existing lines, and are designed to provide additional capacity to transport increased supplies of natural gas to market, the application states.

It is anticipated that Mountain Fuel Supply Co., Salt Lake City, will connect three new Wyoming gas fields to its transmission lines this year. The new fields are Canyon Creek and Sugar Loaf in Sweetwater county and the Ace field in Moffat county. Both Ace and Sugar Loaf have been connected on a "temporary" basis.

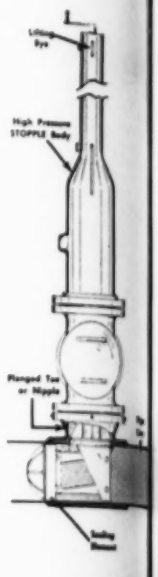
The boards of directors of Tennessee Gas Transmission Co. and its affiliate, Tennessee Production Co., both of Houston, have approved a proposal to merge the production company into the transmission company. (See September *GAS*, page 130.) Special stockholders' meetings of the two firms were scheduled for early this month to vote on the merger.

Stone & Webster Inc. has announced that its subsidiary, Industrial Gas Supply Corp., which has owned a 55% interest in properties engaged in purchasing, producing and transmitting natural gas and distributing it in and around Houston, has now acquired the other 45% from Ship Channel Industrial Gas Corp. for approximately $2 million.

New Products

For additional information on these products use coupon on p. 97.

20 Flow Stopper



T. D. Williamson Inc. has recently announced a simple and effective device that can be inserted into a pipeline through a tapped side opening to provide the equivalent of a temporary gate valve. The device, known as a Stopple, is used to stop flow in a line so that field repairs can be made. When used in pairs, they can isolate a section of a pipeline for the removal of valves or fittings.

The Stopple is inserted through a tapped hole in the pipe wall after the tapping machine has been removed. A crank atop the Stopple is used to move the sealing element into the line and cause it to seal

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JUNG HOTEL	New Orleans	HOTEL GALVEZ	Galveston
HOTEL DESOTO	New Orleans	HOTEL JEAN LAFITTE	Galveston
NEBRASKA		CORONADO COURTS	Galveston
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NEW MEXICO		HOTEL PLAZA	Laredo
HOTEL CLOVIS	Clovis	HOTEL LUBBOCK	Lubbock
SOUTH CAROLINA		HOTEL FALLS	Marlin
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Approved Barrett Applicators are available for protecting pipe in coating plants, yards, in the field, or special work throughout the country. BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N. Y. In Canada: The Barrett Company, Ltd., 5551 Saint Hubert Street, Montreal, Quebec.

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1854 1954 CENTENNIAL Barrett 100 YEARS OF EXPERIENCE

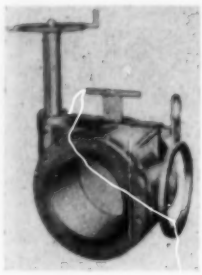
BARRETT PROTECTIVE COATINGS

matically seat in the pipe section adjacent to the tapped hole.

T. D. Williamson Inc.

■

21 Line Blind Valve



Production of 14-in. and 16-in. sizes of rigid - type line blind valves has been announced by Hamer Valves Inc. Previously the largest size produced was 12 in.

The new rigid blind employs an internal expansion principle that eliminates spreading the line in eve nthe slightest degree. They are available in carbon steel as well as other materials and are hand wheel operated to afford ease and added leverage in clamping or releasing the spectacle plate.

Standard packing for valves is Hycar, a highly resistant synthetic rubber. The new spectacle plate is made in two sections, one for full-open and one for permanent-shut-off of the line. A hanger is provided on the side of the valve to carry the section of the spectacle plate not in use.

Hamer Valves Inc.

■

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Trade Literature

22 Compressor Bulletin

Comprehensive engineering details of Cooper-Bessemer's newest engine-driven compressor, the GMVA, have been described in Bulletin No. 75. Performance charts and cut-away drawings provide complete engine details, installation and operation data.

Cooper-Bessemer Corp.

■

23 Gas Reforming Bulletin

Details of a reforming process for producing interchangeable gases at low cost are contained in a new bulletin on the Koppers-Hasche reforming furnace published by Koppers Co. The illustrated, informational bulletin also includes a description of the reforming process and equipment.

Koppers Co.

■

24 Actuator Bulletin

An eight-page bulletin on plug valve actuators has been released by Ledeen Manufacturing Co. The bulletin describes tandem type actuators and floating bar type actuators. In addition it has actuator selection table, typical applications, dimensions and weights, and various mountings.

Ledeen Manufacturing Co.

■

25 Petrochemical Booklet

J. F. Pritchard & Co.'s part in the design, engineering and construction of the petrochemicals plant of the National Petro-Chemicals Corp. at Tuscola, Ill., has been told in a colorful booklet published recently by Pritchard. Descriptive information and numerous photographs are contained.

J. F. Pritchard & Co.

■

26 Fittings Bulletin

A new eight-page bulletin from Telsco Fittings describes that company's malleable iron threadless fittings for joining plastic or steel pipe. In addition to illustrating the many typical uses of Telsco fittings, the colorful bulletin contains specifications on Telsco couplings, adapters, elbows, and fitting reducers and increasers.

Telsco Fittings Division

■

27 Heating Separator Catalogs

Black, Sivalls & Bryson has published two new catalogs. (When ordering copies use letter preceding description together with number of this notice.)

(a) Catalog 32-02 gives complete infor-

PIPELINE KETTLES
STATIONARY CLEANING & PRIMING MACHINES
YARD PIPE RECONDITIONING EQUIPMENT
PORTABLE GENERATORS
ROAD BORING MACHINES
CUTTING & BEVELING MACHINES
CLEANING & PRIMING MACHINES
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COATING & WRAPPING MACHINES
PATCH KETTLES
ENDLESS PIPE BELT SLINGS
Model CPF—for 2" to 8" pipe.
Model M —for 3" to 14" pipe.
Model K —for 16" to 26" pipe.
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The most rugged and dependable cleaning and priming machine on the line . . . equipped with dual multi-speed transmissions providing greater flexibility of control. Interchangeable cleaning and priming assemblies permit each model to process a wide range of pipe sizes.
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Anti-Corrosion Mfg. Co., 2464 Memorial Drive, S.E., Atlanta, Ga.

mation on the new model Series 70 indirect heater, including capacities, dimensions, flow coil sizes, and standard equipment on a newly expanded line.

(b) Catalog 30-10 describes the complete line of Model HLC separators, listing capacities, specifications, and dimensions of the 27 available sizes.

Black, Sivalls & Bryson Inc.

■

28 Weed Control Brochure

A 9-page brochure has been released by E. I. du Pont de Nemours & Co. describing that company's weed and grass control, Telvar W weed killer. Telvar W is the new name for CMU weed killer, which has been in commercial use for more than two years.

E. I. du Pont de Nemours & Co.

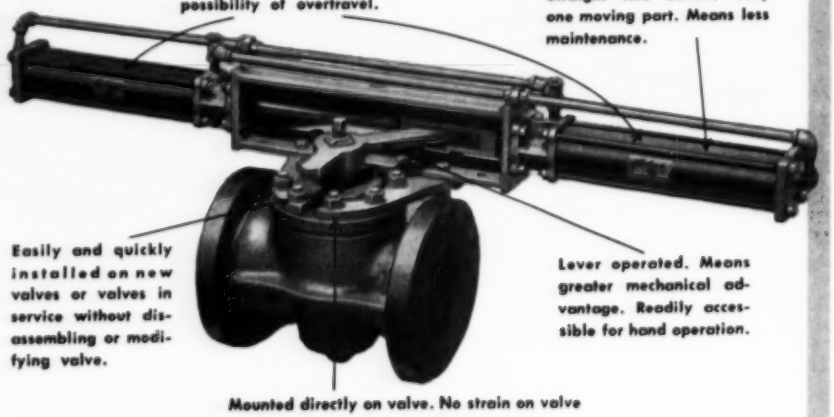
■

29 Engineering Bulletin

A new engineering bulletin describing its latest type JS engines has been released by Cooper-Bessemer. Bulletin J-73 presents specifications and descriptions, together with cut-away drawings showing engine detail and performance charts.

Cooper-Bessemer Corp.

Here is a Simple, Dependable, Safe Plug Valve Operator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Cylinder-type operator. Straight line action. Only one moving part. Means less maintenance.
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Write for Bulletin 3020

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Pipeline People

J. C. Clem

D. B. Crawford

T. D. Williamson Inc.

Staff additions at T. D. Williamson Inc., Tulsa, are DON B. CRAWFORD, superintendent of production and purchasing agent, and JAMES C. CLEM, advertising and sales promotion. Prior to joining Williamson, Mr. Crawford was with Instruments Inc. Mr. Clem's former affiliations include Stanolind Oil & Gas Co. and Refinery Engineering Co.

P. MCDONALD BIDDISON, gas consultant and former vice president of Trunkline Gas Supply Co., has been elected president of Texas-Ohio Gas Co. FRANK CHAMPION, who recently resigned the post, will continue to serve as board chairman.

W. O. ALLEN, assistant district manager in San Antonio for United Gas Pipe Line Co., has succeeded W. W. CLOPTON, who has retired, as manager of the district.

H. J. CORSON has been named to the sales staff of the Protective Coatings division of Pittsburgh Coke & Chemical Co., and will work out of the division's New York office.

M. DEAN WORCESTER, vice president of Glass Fibers Inc., Toledo, Ohio, has been named general manager of the company's new western division with headquarters in Burbank, Calif. He was formerly general manager of the firm's Burbank division, which has now become a part of the larger divisional operation. JOHN T. PODOREAN has been advanced to general sales manager of the division.

DR. WILLIAM R. HAINSWORTH, technical advisor to the executive vice president, has been appointed vice president in charge of the research division of the Fluor Corp. Ltd., Los Angeles.

WILLIAM G. SHEPARD, formerly Chicago division sales manager, has been promoted to the position of general sales manager for the Ohio Injector Co., Wadsworth, Ohio.

MARVIN M. RAMER, formerly contract manager of the division's western headquarters in Tulsa, has been appointed manager of sales promotion of Blaw-Knox Co.'s chemical plants division.